THE UNIVERSITY
of EDINBURGH

Corporate Governance in Chinese Listed Companies:

How Managerial Characteristics Matter?

by

Lu Xing

Doctor of Philosophy

The University of Edinburgh

2018

Declaration

I declare that the thesis has been composed by myself and that the work has not be submitted for any other degree or professional qualification. I confirm that the work submitted is my own, except where work which has formed part of jointly-authored publications has been included. My contribution and those of the other authors to this work have been explicitly indicated below. I confirm that appropriate credit has been given within this thesis where reference has been made to the work of others.

The work presented in chapter 2 was previously published in the following article:

Xing, Lu, Tinghua Duan, and Wenxuan Hou. 'Do Board Secretaries Influence Management Earnings Forecasts?', Journal of Business Ethics (2017): 1–38.

This article was conceived by all of the authors. I carried out the literature review, data collection and empirical analysis, and made a significant contribution to this article.

Signed: Lu Xing

Date: 03/09/2018

Acknowledgements

I would like to thank my principal supervisor, Dr. Angelica Gonzalez, for her valuable advice and insightful input on my research. Her tremendous guidance in econometrics and empirical design is invaluable for my academic career. I am forever indebted for her kindness in being willing to become my supervisor in my most difficult time of PhD. I would also like to thank Prof. Wenxuan Hou for teaching me research skills and broadening my research insights in the early stage of my PhD. My first paper on board secretaries would never be published without his support. I would like to thank Dr. Ben Sila for giving me lots of good ideas and comments to improve and progress my papers. Finally, I would like to express my gratitude to Dr. Lucy Liu, Tinghua Duan and my friends and colleagues in the UEBS finance group for their support and help during my PhD study. This thesis is dedicated to my parents.

Abstract

This thesis consists of three studies on corporate governance issues of Chinese listed companies. In the first study, I investigate the role of board secretaries in management earnings forecasts. Individuals in this senior executive position are responsible for coordinating information disclosure. I find that their legal and accounting expertise and foreign experience help improve management earnings forecast quality. The quality of forecasts, as indicated by forecast occurrence, frequency, precision and accuracy, is positively associated with board secretaries' duality role and equity holdings, whereas it is negatively associated with their political connections. The quality of forecasts is found to increase the compensation of board secretaries. Finally, I show that the equity holdings of board secretaries reduce litigation risks and increase corporate philanthropic giving.

Based on the notion that women cooperate more with women than with men, my second study examines the gender interaction effect between female top managers and female board directors in Chinese firms. I show that this gender interaction is positively associated with the firm's accounting return but negatively associated with its stock price return. Earnings management, which can lead to overstated accounting numbers but unfavourable stock market reactions, partly explains the opposite results. Furthermore, I find that only the newly appointed female top managers engage in this earnings management. Overall, the findings suggest that the pressure on women to perform leads to 'women helping women', which is detrimental to shareholders' value.

Women are underrepresented on corporate boards. By employing the large variation in socioeconomic development across provinces of China, the third study shows that the barriers to board gender diversity are deeply rooted in societal gender role attitudes. I find that corporate boards tend to be more gender diverse in a province where there is a smaller gender difference in educational achievement in STEM disciplines, where there is a stronger belief that women and men possess equal intrinsic abilities, or where female political leaders are present in the provincial government or communist party. However, I find little evidence that female labour force participation or childcare provision would affect board gender diversity. Collectively, the findings suggest that it is the gender equality attitudes rather than the supply of average female labour that contribute to gender-diverse corporate boards.

Table of Contents

Chapter 1

Introduction

Focusing on the research area of corporate governance, this thesis studies how managerial characteristics affect firm outcomes by shaping corporate governance. By definition, corporate governance is the system of mechanisms, processes and practices that are used to control and govern companies. The function of corporate governance system is largely dependent on the effectiveness of management, which is linked to the managers' personal characteristics. Most of previous literature in this field has employed a variety of financial data from advanced economies to establish empirical findings. More recently, a growing number of studies in top finance journals have turned to use Chinese data (e.g., Ayyagari *et al.* 2010; Giannetti *et al.* 2015; Qian *et al.* 2015; Ru 2017). The increasing attention in China is not surprising because the Chinese economy is influential and interesting. Despite being the second largest economy in the world, China is governed by weak formal legal and regulatory systems relative to developed countries (Allen *et al.* 2005). When the external governance is inadequate to protect investors and shareholders, an effective internal corporate governance system is crucial. Thus, it is worthwhile to study what managerial characteristics can improve corporate governance and consequently firm performance. This thesis deals with this research question by using two unique features of Chinese listed firms.

First, board secretary is a unique managerial post in Chinese firms, who oversees corporate information disclosure to outside investors and regulators.

The first study of the thesis examines what characteristics of board secretaries are related to the quality of corporation information disclosure. In western countries, corporate information is usually disclosed by CEOs or CFOs. However, CEOs and CFOs have many other duties and have great influence on comprehensive corporate tasks. It is difficult to link their specific characteristics directly to individual tasks such as information disclosure. The unique post of board secretary in China and their defined role in information disclosure afford me an opportunity to circumvent this problem.

Second, Chinese firms have significantly higher female representation among CEO, CFO and executive director posts than U.S. firms. This unique feature of Chinese firms is necessary for studying gender issues in corporations. Simply speaking, if there are no women in these posts, it is impossible to study how gender-related factors can influence managers' performance. Using this unique setting, the second and third studies of this thesis examine the effect of managerial gender in Chinese firms.

Chapters 2–4 of this thesis contains three separate empirical studies. In each chapter, I first formulate the hypotheses based on existing literature and then build empirical models using data collected from well-established databases for Chinese listed firms, such as CSMAR, RESSET and China Statistical Yearbook. I analyse the data by employing standard econometrics techniques, including ordinary least squares (OLS) regressions, two-stage least squares (2SLS) regressions, probit regressions, margin analysis and event study.

Chapter 2 shows that board secretaries who have more expertise in legal and accounting areas, dual senior roles in the firms, and more equity incentives are more likely to issue management forecasts of higher quality. Politically connected board secretaries are found to be associated with lower forecast quality. Board secretaries with accounting expertise, dual senior roles and more equity incentives are more likely to issue bad news forecasts and downward guidance forecasts. Moreover, board secretaries who issue high-quality forecasts have higher compensation and are less likely to be replaced. Overall, the results suggest that board secretaries play an important role in management earnings forecast disclosure. Finally, board secretaries have pervasive influences on corporate issues such as litigations and corporate social responsibility practices.

Chapter 3 examines the gender interaction between female top managers and female board directors. The literature in sociology has shown that women are different from men in their core values (Sapienza *et al.* 2009; Adams & Funk 2012). In the corporate governance field, the prior literature has either assessed the gender composition of the top management team or of the board of directors (Adams & Ferreira 2009; Huang & Kisgen 2013; Faccio *et al.* 2016). Given the evidence that women cooperate more with women than with men (Weber & Zulehner 2010; Matsa & Miller 2011; Price 2012; Tate & Yang 2015), I argue that the gender interaction between female top managers and female board directors can take place and exert an impact at the firm level. I show that this gender interaction increases ROA but depresses stock prices. Further analysis shows that the increased ROA is due to earnings management.

Finally, I find that the gender interaction effects disappear when women managers hold their leadership roles for more than one year. The results suggest that when women leaders face stronger performance pressure during their initial year in leadership, they tend to liaise with women directors to sugar-coat their performance through earnings manipulation, which hurts shareholders' value.

Chapter 4 explores the sources of gender diversity on corporate boards. Historically, women have been severely underrepresented on the board of directors (Adams & Kirchmaier 2015). Previous regulatory policies that aim to increase board gender diversity, such as mandatory gender quota, have all targeted firms. If barriers to women's participation on the board are rooted in local communities – for example, if there exist negative gender stereotypes – then it is necessary to take actions at a societal level. My results support this argument by showing that board gender diversity is positively associated with three provincial-level gender equality proxies, including (1) the gender composition of the student enrolment from each province into Tsinghua University, the top-ranked STEM-oriented university in China; (2) the beliefs about gender differences in intrinsic abilities, career development and housework division from the Chinese General Social Survey; and (3) the existence of female political role models in the provincial government and communist party. Finally, I find that female labour force participation rates and childcare provision, which have potential effects on women's supply, do not affect board gender diversity. Collectively, the results suggest that board

gender diversity is associated with local gender equality environments, not the supply of women at grass-root levels.

This thesis makes three major contributions to the corporate governance literature. The first study on board secretaries opens a new research avenue for the top management team (TMT) literature by studying a unique top managerial post in Chinese firms. This study suggests that board secretaries' characteristics affect corporate information disclosure, which has implications for regulators and policymakers to increase corporate financial transparency. The second study bridges two strands of literature on the gender composition of the TMT and the gender diversity of the board of directors. It further extends the work of Amore *et al.* (2014) by showing that the gender interaction between female top managers and female board directors leads to a short-lived increment in ROA, which is a result of earnings management. The third study provides the first evidence that improved provincial-level gender equality beliefs can promote corporate board gender diversity. This study contributes to board gender diversity literature by suggesting that the sources of the diversity are deeply rooted in gender role ideology in local communities.

This thesis is structured as follows. Chapter 1 introduces the whole thesis. Chapter 2 presents the article entitled 'Do Board Secretaries Influence Management Earnings Forecasts?' published in the *Journal of Business Ethics* in 2017. Chapter 3 presents my working paper entitled 'Does Gender Interaction Enhance or Impede Firm Performance?' Chapter 4 presents my recent work exploring the sources of corporate board gender diversity, entitled

‘Do Local Gender Equality Attitudes Affect Women’s Representation on Corporate Boards?’ Chapter 5 concludes this thesis.

Chapter 2

Do Board Secretaries Influence Management Earnings Forecasts?

2.1. Introduction

Managers often release earnings forecasts prior to the actual earnings announcement to show their ability to anticipate economic environment changes and adjust production plans (Trueman 1986; Marini 1989). Various characteristics of a top management team (TMT) affect the style of management earnings forecasts (Bamber *et al.* 2010). The literature has largely examined the roles of Chief Financial Officer (Geiger & North 2006; Jiang *et al.* 2010), Chief Counsel[1] (Kwak *et al.* 2012; Hopkins *et al.* 2014; Bird *et al.* 2015), Chief Risk Officer (Aabo *et al.* 2005), Chief Knowledge Officer (Earl & Scott 1999) and Chief Marketing Officer (Nath & Mahajan 2008). From 2006, Chinese listed companies are required to have a board secretary to coordinate information disclosure and board meetings. According to the Chinese Company Law, board secretaries are a top manager role, not a non-executive role. This article studies how board secretaries influence management earnings forecasts.

Although board secretaries in China and company secretaries in other countries share similar responsibilities for coordinating board meetings,

[1] The Chief Counsel is the head of the legal department, and is also known as General Counsel or Chief Legal Officer.

managing internal information flow and ensuring regulatory compliance,[2] board secretaries have additional responsibilities for firms' information disclosure to and relationship management with outside investors. Since board secretaries are top managers and managers' personal characteristics are found to influence management earnings forecasts (Bamber *et al.* 2010), we expect that professional expertise could influence the professional ability of board secretaries in fulfilling their earnings forecasts duties. Board secretaries with legal expertise are better aware of litigation risks and, hence, are more likely to make fair forecasts to reduce information asymmetry (Kwak *et al.* 2012). Board secretaries with an accounting background have sound knowledge of firms' financial situation and can make more accurate forecasts. Board secretaries with international experience usually possess advanced knowledge about legal institutions and corporate governance (Giannetti *et al.* 2015; Duan & Hou 2017) and, therefore, tend to improve the quality of management earnings forecasts.

Political connection is another important managerial characteristic in the Chinese setting. Politically connected managers are often entrenched in firms and are less likely to be replaced, reducing their incentive to improve firm performance (Cao *et al.* 2011; You & Du 2012). In addition, politically connected managers in state-owned enterprises (SOEs) may pursue social objectives rather than the maximisation of shareholder wealth (Fan *et al.* 2007).

[2] McNulty and Stewart (2015) point out that company secretaries are responsible for statutory returns and regulatory compliance, supporting board chairs and influencing board processes and outcomes.

Politically connected board secretaries may be former bureaucrats who are lack of business knowledge or experience. We expect that politically connected board secretaries – those who are members of the Chinese communist party – are likely to issue low-quality forecasts.

Role duality for board secretaries is common. Many board secretaries also sit on the board or serve as a senior executive (e.g., CFO). Role duality can bring information advantage, expand managerial power (Finkelstein 1992) and strengthen managerial entrenchment (Finkelstein & D'aveni 1994). We expect that board secretaries holding duality roles have better access to corporate internal information and resources and thus generate high-quality management earnings forecasts.

Finally, managerial ownership can align the interests of managers and shareholders and mitigate agency problems (Jensen & Meckling 1976; Datta *et al.* 2005). Nagar *et al.* (2003) show that the alignment of CEO and shareholders' interests increases the frequency of management earnings forecasts. We predict that board secretaries with more equity holdings are more willing to serve the interests of shareholders by issuing management forecasts of higher quality.

To test our four predictions, we hand collect the characteristics of board secretaries for the period 2002–2012. We examine the impact of board secretaries on five proxies for the quality of management earnings forecasts – forecast occurrence, frequency, precision, accuracy and optimism. The empirical results support our predictions: management forecast quality is

positively related to the expertise, role duality and equity holdings of board secretaries, but is negatively related to their political connections. Further, board secretaries with accounting expertise, role duality and equity holdings are more likely to issue bad news and downward guidance forecasts, which help reduce legal and reputational risks. In addition, we study the influence of management earnings forecasts on corporate decisions regarding board secretaries' compensation and turnover. We find that board secretaries engaging in high-quality forecast disclosure receive higher compensation and have more stable job retention. Finally, we perform additional analyses to examine the board secretaries' impact on corporate policy and show that equity holdings of board secretaries reduce firms' litigation risks and improve corporate social responsibility. Overall, the results suggest an important role of board secretaries in management earnings forecasts.

Our study contributes to the literature in three ways. First, to the best of our knowledge, this is the first study on board secretaries, opening a new research avenue for TMT studies. It also complements the existing literature on the roles of Chief Financial Officer (Geiger & North 2006; Jiang *et al.* 2010), Chief Counsel (Kwak *et al.* 2012; Hopkins *et al.* 2014; Bird *et al.* 2015), Chief Risk Officer (Aabo *et al.* 2005), Chief Knowledge Officer (Earl & Scott 1999) and Chief Marketing Officer (Nath & Mahajan 2008).

Second, this study adds to the management forecast literature by finding a new managerial determinant of the forecast quality. The existing literature has documented the impact of demographic characteristics of top managers, such as CEO, CFO and Chief Counsel, on firms' forecasting decisions

(Bamber *et al.* 2010; Baik *et al.* 2011; Brochet *et al.* 2011; Kwak *et al.* 2012; Cassell *et al.* 2013). We provide original evidence that the quality of management earnings forecasts is also related to board secretaries' professional expertise, political connections, role duality and equity holdings.

Third, this study contributes to studies of managerial effects on business ethics (Rogers & Stocken 2005; Slater & Dixon-Fowler 2009; Chen *et al.* 2016; Lee 2017). As the accurate and timely disclosure of corporate information is a fundamental element of ethical communication (Holley 1998; Ruppel & Harrington 2000), management earnings forecasts play a key role in investor protection. Ethical managers are expected to provide high-quality forecast information to stakeholders. Furthermore, our findings suggest that board secretaries also impact the firms' litigation risks and corporate social responsibility.

This study has important policy implications for regulators and policy makers who aim to establish an effective governance mechanism within the context of China. Our results suggest that certain requirements regarding the expertise and equity holdings of board secretaries will help improve management earnings forecast quality. Appointing a board member or senior executive of the firm as its board secretary will also be beneficial.

The remainder of this chapter is organised as follows. Section 2.2 introduces the institutional background. Section 2.3 reviews the related literature and develops the hypotheses. Section 2.4 describes the sample and the research design. Section 2.5 presents the main results. Section 2.6 present

the results of additional tests. Section 2.7 concludes this chapter.

2.2. Institutional background

The top management team (TMT) is a group of individuals who manage the operations of the firms at the highest corporate level. The TMT typically consists of Chief Executive Officer, Chief Financial Officer, Chief Technology Officer, Chief Operations Officer, Chief Marketing Officer, Chief Counsel and Chief Risk Officer.

As a unique post in Chinese firms, the board secretary is a part of the TMT. As prescribed in the *Guidance for the Articles of Listed Company* (1997) and the *Company Law of the People's Republic of China* (2005), it is the responsibility of board secretaries to deliver corporate information to stakeholders. The *Rules Governing the Listing of Stocks on Shanghai Stock Exchange* (2008) and the *Rules Governing the Listing of Stocks on Shenzhen Stock Exchange* (2008) further strengthen board secretaries' information disclosure roles by stating that 'a listed company must establish an information disclosure department and put the board secretary to manage this department'; 'the board secretary is responsible for disclosing material information to the public, coordinating information disclosure matters, establishing standardised information disclosure systems and urging other managers to observe relevant disclosure regulations'; and 'the board secretary is responsible for disclosing corporate information in a timely manner, ensuring confidentiality with regard to information disclosures and reporting to the stock exchange whenever any

non-published material information is leaked.'[3]

Board secretaries have other obligations. First, board secretaries are responsible for ensuring corporate decisions in compliance with laws and regulations by providing professional legal advice to the TMT. Second, they educate other top managers about the latest rules and regulations on information disclosure. Third, they act as a liaison between firms and different regulatory agencies, such as the China Securities Regulatory Commission (CRSC), the Shanghai and Shenzhen stock exchanges and local securities authorities. Fourth, they answer the consulting calls of investors, communicate with media reporters and assist financial analysts' investigation in the firms. Overall, board secretaries perform multiple duties in corporate operations and aim to improve information disclosure and corporate governance.

The post of Chinese board secretaries is originated from company secretaries in western countries. Although individuals in both roles serve as senior executives in charge of issues such as provision of legal assistance, safekeeping of business documents and maintaining contact with investors, Chinese board secretaries differ greatly from company secretaries in certain aspects. Since the *Model Business Corporation Act of 1984* granted U.S. firms the discretion to specify titles and duties for their management team members, the original role of company secretaries in U.S. firms has been blurred. For instance, instead of company secretaries, in the U.S. CEOs and CFOs often

[3] Source: http://english.sse.com.cn/laws/framework/; http://www.szse.cn/main/en/RulesandRegulations/SZSERules/GeneralRules/

release corporate information to the public, General Counsels often liaise with regulators, and Chief Compliance Officers ensure the firms' legal compliance. In China board secretaries report directly to boards of directors, whereas in the U.S. company secretaries report to General Counsels or CEOs.

As Chinese board secretaries undertake legal and regulatory duties and expose themselves to high litigation risks of irresponsible forecast disclosure, Chinese board secretaries could have a more active and positive role in corporate information disclosure than company secretaries of western countries. Further, Chinese board secretaries report directly to boards of directors and are expected to safeguard the interests of shareholders by making accurate information disclosure.

The financial forecasting of Chinese firms is different from that of U.S. firms in two ways. First, Chinese firms generate their forecast based on the deviation of their own prediction about future earnings from the actual earnings of the firms in the corresponding period of the previous year, while U.S. firms make a forecast by comparing the consensus market expectation about future earnings with their own prediction of the earnings. Second, Chinese listed firms usually issue management forecasts of future net profits, whereas U.S. firms usually issue management forecasts of future earnings per share (EPS).

2.3. Literature and hypotheses development

2.3.1. The literature

Previous literature has shown that top managers have an influence on management earnings forecasts. Baik *et al.* (2011) document a positive relation between CEO ability and the likelihood, frequency and accuracy of management earnings forecasts. Stock markets respond more strongly to earnings forecasts issued by more capable CEOs, which suggests that management earnings forecasts communicate information regarding CEOs' ability to the market. Cassell *et al.* (2013) show that retiring CEOs are more likely to issue earnings forecasts in the final year of their tenure, and that those final-year forecasts are more likely to convey good news. This result is more significant when CEOs have more equity holdings or when CEOs cut final-year spending in R&D and capital expenditure. These findings suggest that retiring CEOs tend to manage final-year earnings forecasts for self-serving benefits. Kwak *et al.* (2012) find that firms with a General Counsel in the TMT are more likely to issue earnings forecasts, and that their forecasts are less optimistic and more accurate. They further show that the influence of General Counsels on forecast disclosure is more salient when the General Counsel holds an additional role of company secretary or has higher compensation.

The literature also documents a link between management styles and the voluntary disclosure of earnings forecasts. Bamber *et al.* (2010) show that managers' styles regarding earnings forecast disclosure are associated with their career path, age cohort, military experience, education and legal

background. Brochet *et al.* (2011) find that firms that appoint new CEOs with previous forecasting experience are more likely to issue earnings forecasts. Regarding CFOs, they further document that, in firms that have historically issued earnings forecasts, there is a temporary break in the forecast issuance following CFO turnover. The subsequent forecasts by the new CFO are less precise due to the CFO's little experience in the firm or the industry.

The literature suggests that managers tend to strategically manage earnings forecasts to serve their own benefits. Cheng and Lo (2006) report that managers who plan to buy their firm's stocks are more likely to issue bad news forecasts in order to reduce the purchase price, while managers who plan to sell their firm's stocks tend to maintain their forecasting style in view of the high litigation risks associated with insider sales. Cheng *et al.* (2013) find that before insider sales, the more positive news forecasts issued by the managers are more precise. They further show that managers are less inclined to strategically manage forecast precision when large institutional investors are present or when this forecasting behaviour poses high litigation risks.

Management earnings forecast outcomes also have implications for individual managers. Trueman (1986) reports that investors use management forecast quality to evaluate managers' ability to adjust production plans in response to foreseeable changes in business environments. Lee *et al.* (2012) find that inaccurate management earnings forecasts result in quick replacement of CEOs in underperforming firms. This suggests that when making decisions on CEO replacement, the board of directors evaluates CEOs' ability of coping with the deteriorating business conditions based on the

accuracy of management earnings forecasts. The relation between forecast accuracy and CEO turnover is more pronounced when the CEOs are less entrenched in the firms.

2.3.2. Hypothesis 1: Expertise

Research in the area of corporate governance has long focused on the effects of top managers' demographic characteristics on firm performance (Nelson 2005; Kaplan *et al.* 2012). Bamber *et al.* (2010) show that top managers' personal characteristics, including age, education and functional experience, affect management earnings forecasts. Since board secretaries are members of the TMT and are legally responsible for information disclosure, we argue that their demographic characteristics, such as legal expertise, accounting expertise and international experience, are associated with their competence in improving management forecasts.

Board secretaries with legal expertise are more sensitive to litigation risks induced by information asymmetry and hence more likely to improve forecast quality. Further, since these board secretaries are more capable of advising the TMT on issues related to legislative and regulatory compliance, this can form a competent TMT which can better manage the firm's overall risk and information disclosure practice. In addition, the forecasts of the firms' earnings demand board secretaries' accounting knowledge. Board secretaries with accounting expertise have a better understanding of the firms' financial conditions and thus can have a more accurate prediction of the future earnings.

International experience has been identified as an important managerial

characteristic. Chinese returnee managers have opportunities to learn about advanced legal institutions and superior management practices in foreign countries (Duan & Hou 2017). Giannetti *et al.* (2015) provide evidence that board directors with international experience can transfer advanced governance and management knowledge they acquired from overseas to Chinese firms, which leads to improved corporate governance and earnings performance of the local firms. In addition, managers' international experience has been found to improve the firms' social performance in local communities (Slater & Dixon-Fowler 2009). We expect that Chinese board secretaries with international work or study experience are more likely to enhance the quality of management earnings forecasts. We propose hypothesis H1 as follows.

H1: The expertise of board secretaries (H1a: legal expertise, H1b: accounting expertise, H1c: international experience) is positively related to management forecast quality.

2.3.3. Hypothesis 2: Political connection

It has been shown that in Chinese firms, managers' political connections can undermine the firms' financial performance because these managers lack business experience and often pursue private gains rather than shareholder wealth maximisation (Fan *et al.* 2007). In addition, political connections aggravate managerial entrenchment and impede managerial accountability (Cao *et al.* 2011; You & Du 2012). We therefore expect that politically connected board secretaries are less capable of issuing high-quality earnings forecasts. We propose hypothesis H2 as follows.

H2: The political connection of board secretaries is negatively related to management forecast quality.

2.3.4. Hypothesis 3: Role duality

In Finkelstein's (1992) framework, the structural power of individual managers is assessed by the number of official titles they hold. He points out that top managers' ability to influence corporate decisions is contingent on their power. In China, board secretaries often have a duality role and serve as the firm's board director, CFO or another senior executive post (e.g. president or vice-president). We argue that board secretaries holding additional senior titles can access and employ more resources to provide management earnings forecasts of higher quality.

The organisation theory suggests that the consolidation of management and board roles promotes unity of command and increases organisation effectiveness (Boyd 1990; Donaldson & Davis 1991; Boyd 1995; Pfeffer & Salancik 2003). Board secretaries who are also board members have their own interests better aligned with shareholders, which could enhance forecast quality. Board secretaries who are CFOs have better insights into the firms' financial information and can take this advantage to issue accurate forecasts. Board secretaries who hold another senior executive post in the firms are more involved in the firms' business operations, which potentially results in higher forecast quality. We thus propose hypothesis H3 as follows.

H3: The role duality of board secretaries (H3a: board member, H3b: CFO, H3c: another senior executive role) is positively related to management

forecast quality.

2.3.5. Hypothesis 4: Equity holding

Producing high-quality forecasts is sometimes costly and board secretaries may have incentives (e.g., insider trading) to withhold corporate information. Jensen and Meckling (1976) and Datta *et al.* (2005) point out that managerial equity holdings can alleviate agency problems and facilitate managers' incentive alignment with investors. Nagar *et al.* (2003) find that CEOs whose interests are better aligned with those of shareholders issue earnings forecasts more frequently. We expect that equity holdings can incentivise board secretaries to issue high-quality forecasts. We propose hypothesis H4 as follows.

H4: The equity holding of board secretaries is positively related to management forecast quality.

2.4. Data and research design

2.4.1. Sample construction

We hand collect board secretaries' characteristics from their biography files in the China Securities Market and Accounting Research (CSMAR) database for all listed firms on the main board of the Shenzhen Stock Exchange between 2002 and 2012.[4] We obtain management earnings forecast data from the RESSET database. Both quarterly and annual management earnings forecasts are retained. Following Anilowski *et al.* (2007), we require that a quarterly management forecast is issued before the earnings announcement for the forecast fiscal quarter and no more than 90 days prior to the end of that fiscal quarter. For annual forecasts, we require that the forecast is issued prior to the earnings announcement for the forecast fiscal year and no more than 730 days prior to the end of that fiscal year.

Table 2.1 summarises the definition and data sources of the variables. We merge the management forecast data with data on board secretary characteristics, corporate governance and firm characteristics. The final sample to conduct management forecast occurrence and frequency analyses contains 6,840 firm-year observations. Out of them, 5,362 firm-years have at least one management forecast issuance, which will be used to analyse

[4] Due to the high workload in data hand-collection, we only include firms listed on the Shenzhen Stock Exchange. There is no evidence that the role of board secretaries in the Shanghai Stock Exchange would be any different. The sample starts from 2002 because management earnings forecast data is available in the RESSET database from 2002.

Table 2.1 Variable Definitions

Variable	Definition	Data Source
Occurrence	A dummy variable equal to 1 if a firm issues at least one management forecast in a given year, and 0 otherwise.	RESSET
Frequency	The total number of management forecasts issued by a firm in a given year.	RESSET
Precision	Coded as 3 if a firm issues a point forecast, 2 if it issues a range forecast, 1 if it issues an open-interval forecast, and 0 if it issues a qualitative forecast.	RESSET
Accuracy	The absolute difference between the management forecast of net profits and the actual net profits, scaled by the market value of tradable shares on the day prior to the forecast release date, and then multiplied by –1.	RESSET
Optimism	Coded as 1 if the forecasted net profit is higher than the actual net profits, 0 if it is equal to the actual net profits, and –1 if it is lower than the actual net profits.	RESSET
Ln(Horizon)	The natural logarithm of the number of days between the forecast release date and the actual earnings announcement date.	RESSET
Pr(BadNews)	A dummy variable equal to 1 if a firm issues at least one bad news management forecast in a given year, and 0 otherwise.	RESSET
#BadNews	The total number of bad news management forecasts issued by a firm in a given year.	RESSET
%BadNews	The fraction of management forecasts that convey bad news.	RESSET
Law	A dummy variable equal to 1 if a board secretary holds a lawyer license, and 0 otherwise.	CSMAR
Accounting	A dummy variable equal to 1 if a board secretary holds a professional accounting certificate, and 0 otherwise.	CSMAR
ForeignExp	Coded as 1 if a board secretary has work or study experience in a foreign country, 0.5 if s/he has work or study experience in Hong Kong, Macau or Taiwan, and 0 otherwise.	CSMAR
PartyMeb	A dummy variable equal to 1 if a board secretary is a member of the Chinese communist party, and 0 otherwise.	CSMAR
Board_Duality	A dummy variable equal to 1 if a board secretary sits on the board of the firm, and 0 otherwise.	CSMAR
CFO_Duality	A dummy variable equal to 1 if a board secretary serves as the firm's CFO, and 0 otherwise.	CSMAR
Mag_Duality	A dummy variable equal to 1 if a board secretary holds an additional non-accounting senior executive position in the firm, and 0 otherwise.	CSMAR
EquityHold	The natural logarithm of 1 plus the equity holding, where equity holding is defined as the change in the value of the board secretary's stockholding of the firm given a 1% increase in the firm's stock price	CSMAR

Female	A dummy variable equal to 1 if a board secretary is female, and 0 otherwise.	CSMAR
Age	The age of a board secretary.	CSMAR
Ln(Tenure)	The natural logarithm of the number of days that a board secretary has held this post.	CSMAR
Ln(Pay)	The natural logarithm of the sum of a board secretary's salary and bonus.	CSMAR
Turnover	A dummy variable equal to 1 if a board secretary steps down from this post in a given year, and 0 otherwise.	CSMAR
BIndep	The proportion of independent directors on the board.	CSMAR
InstHold	The proportion of shares held by institutional investors.	RESSET
GovHold	The proportion of shares held by the Chinese government.	RESSET
CR	The proportion of stocks held by a firm's ten largest blockholders.	RESSET
Duality	A dummy variable equal to 1 if a CEO works as the chair of the board, and 0 otherwise.	CSMAR
BMeet	The number of board meetings.	CSMAR
P/B	The ratio of market value to book value of equity.	CSMAR
Ln(Assets)	The natural logarithm of total assets.	CSMAR
MBE	A dummy variable equal to 1 if a firm's actual earnings meet or beat the most recent consensus analyst forecast, and 0 otherwise.	CSMAR
CMBE	A dummy variable equal to 1 if a firm's actual earnings meet or beat the most recent consensus analyst forecast for the past two consecutive years, and 0 otherwise.	CSMAR
Crisis	A dummy variable equal to 1 if the observation year is in the crisis period of 2007-2008, and 0 otherwise.	N/A
Industry	The first two digits of the Global Industry Classification Standard (GICS) code.	CCER
MAO	A dummy variable equal to 1 if a modified auditor opinion is issued to a firm, and 0 otherwise.	CSMAR
SUE	A dummy variable equal to 1 if there is a lawsuit against a firm, and 0 otherwise.	CCER
Donation	The natural logarithm of social donations (in Chinese RMB).	CSMAR
CSR_Disclose	A dummy variable equal to 1 if a firm discloses its corporate social responsibility practice in its annual report, and 0 otherwise.	CSMAR
CapExp	The ratio of capital expenditure to cash flow	CSMAR
Opacity	The absolute value of discretionary accruals calculated based on the Dechow and Dichev's (2002) model.	CSMAR
ROA	Return on assets.	CSMAR
ROS	Return on sales.	CSMAR

management forecast precision. For analysis of forecast accuracy and optimism, the sample size is further reduced to 4,818 firm-years due to missing data of firms' earnings or stock price.

2.4.2. Empirical model

Forecasting quality can be evaluated through five forecasting properties: occurrence, frequency, precision, accuracy and optimism. *Occurrence* is a dummy indicator equal to 1 if there is at least one management forecast issuance in a given firm-year, and 0 otherwise. *Frequency* is the total number of forecasts issued by a firm in a given year. *Precision* is coded as 3 if the forecast is a point forecast, 2 if it is a range forecast, 1 if it is an open-interval forecast, and 0 if it is a qualitative forecast. *Accuracy* is the absolute difference between the management forecast of net profits and the actual net profits, scaled by the market value of tradable shares one day prior to the forecast release date, and then multiplied by –1. A lower value of *Accuracy* indicates lower management forecast accuracy.[5] *Optimism* is coded as 1 if the management earnings forecast is higher than the actual net profits (i.e., optimistic bias), 0 if it is equal to the actual net profits, and –1 if it is less than the actual net profits (i.e., pessimistic bias).

To examine the impact of board secretary characteristics on the properties of management earnings forecasts, we use the following regression model:

[5] Forecast accuracy can be measured only when there is a forecast release. Hence, forecast occurrence and frequency are also necessary for us accessing forecasting quality.

$$ForecastProperty_{i,t+1} = \beta_0 + \beta_1 Expertise_{i.t} + \beta_2 PartyMeb_{i.t} + \beta_3 Duality_{i.t} + \beta_4 EquityHold_{i.t} + \sum \beta_k Controls_{k,i,t} + \varepsilon_{i,t+1}$$

(Equation 2.1)

where *i* indexes firm, and *t* indexes year. The dependent variable measures one of the following forecast properties: *Occurrence*, *Frequency*, *Precision*, *Accuracy* and *Optimism*.

When firms issue multiple forecasts in a year, we take their average values to construct *Precision*, *Accuracy* and *Optimism*. We use point, range and open-interval forecasts to construct *Accuracy* and *Optimism*. For range forecasts, the midpoint of the range is used as the management forecast estimate (Kross *et al.* 2011). For open-interval forecasts, the value provided in the open interval forecast is taken as the management forecast estimate (Yang 2012; Cassell *et al.* 2013).

We examine how these forecast properties are associated with board secretary characteristics, including expertise, political connection, role duality and equity holding. We construct three variables as proxies for the expertise. *Law* is a dummy variable equal to 1 if a board secretary holds a lawyer license, and 0 otherwise. *Accounting* is a dummy variable equal to 1 if a board secretary holds a professional accounting certificate, and 0 otherwise. *ForeignExp* is coded as 1 if a board secretary has work or study experience in foreign countries, 0.5 if s/he has work experience in Hong Kong, Macau or Taiwan, and 0 otherwise. Following Li *et al.* (2008), we use the membership in the Chinese communist party as a proxy for the political connection of board

secretaries. *PartyMeb* equals 1 if the secretary is a member of the Chinese communist party, and 0 otherwise.

We also examine three forms of board secretary duality as indicated by *Board_Duality, CFO_Duality* and *Mag_Duality*. *Board_Duality* is a dummy variable equal to 1 if the board secretary is the firm's board member, and 0 otherwise. *CFO_Duality* is a dummy variable equal to 1 if the board secretary serves as the firm's CFO, and 0 otherwise. *Mag_Duality* is a dummy variable equal to 1 if the board secretary holds an additional non-accounting senior executive post in the firm, and 0 otherwise.

Finally, we examine the effect of board secretaries' equity holdings on management forecast properties. The equity holding is measured as the change in the value of the secretary's stockholding of the firm given a 1% increase in the firm's stock price (Bergstresser & Philippon 2006; Burns & Kedia 2006). The natural logarithm of 1 plus the equity holding calculated above constitutes the variable *EquityHold*.

The regressions control for a number of demographic characteristics of board secretaries. *Female* is a dummy variable equal to 1 if a board secretary is female, and 0 otherwise. *Age* is the age of the board secretary. *Ln(Tenure)* is the natural logarithm of the number of days that a board secretary has held this post. If there is a board secretary replacement within a firm-year, we use the characteristics of the board secretary holding the post at the year-end to construct these variables.

Previous literature suggests that better corporate governance improves

management forecast quality (Ajinkya *et al.* 2005; Karamanou & Vafeas 2005). We thus control for corporate governance characteristics. *BIndep* is the proportion of independent directors on the board. *BMeet* is the number of board meetings. *Duality* is a binary variable equal to 1 if a CEO serves as the board chair, and 0 otherwise. *InstHold* is the proportion of shares held by institutional investors. *GovHold* is the proportion of shares held by the Chinese government.

The regressions control for a variety of firm-level characteristics.[6] Since Ajinkya *et al.* (2005) find a negative relation between ownership concentration and management forecast properties, we control for the concentration ratio (*CR*), measured as the proportion of stocks held by the firm's ten largest blockholders. The price-to-book ratio (*P/B*) is included to account for the firms' growth opportunities. Bamber and Cheon (1998) find that growth opportunities serving as an indicator of proprietary costs can affect firms' forecasting choices. *Ln(Assets)* is calculated as the natural logarithm of a firm's total assets, and is included in our model because firm size has been found to affect forecast disclosures (Kasznik & Lev 1995; Baginski & Hassell 1997). We also control for *Crisis*, which is a dummy indicator of the crisis period of 2007–2008. Moreover, the literature on voluntary information disclosure suggests that firms

[6] The literature has shown that managers are likely to issue management forecasts to meet or beat the market's expectations (Matsumoto 2002; Kross *et al.* 2011). As a robustness test, we further control for *meeting or beating earnings expectations* (MBE) and *consistency in meeting or beating earnings expectations* (CMBE). *MBE* equals 1 if a firm's actual earnings meet or beat the most recent consensus analyst forecast, and 0 otherwise. *CMBE* equals 1 if a firm's actual earnings meet or beat the most recent consensus analyst forecast for the past two consecutive years, and 0 otherwise. The results of the regressions including these two additional control variables are broadly unchanged.

in different industries are exposed to different litigation costs, proprietary costs and information asymmetry severity, and thus manage their forecasting policies with different strategies (Kasznik & Lev 1995; Bamber & Cheon 1998). Therefore, we include *Industry* dummies, defined as the first two digits of the firm's Global Industry Classification Standard (GICS) code.

We estimate Equation 2.1 using a Probit model if the dependent variable is *Occurrence*, a Poisson model if the dependent variable is *Frequency*, and an ordinary least squares (OLS) regression if the dependent variable is *Precision*, *Accuracy* or *Optimism*. For the regressions of *Precision*, *Accuracy* and *Optimism*, we add an additional control variable, *Ln(Horizon)*, which is the natural logarithm of the number of days between the forecast release date and the actual earnings announcement date. *Ln(Horizon)* is included because the literature has found a negative relation between forecast horizon and forecast precision and accuracy (Pownall *et al.* 1993; Baginski & Hassell 1997; Xu 2010). If multiple forecasts are issued within a firm-year, we take the average horizon to generate the data. The independent variables of Equation 2.1, except *Ln(Horizon)*, are lagged by one year relative to the dependent variable in order to mitigate reverse causality. We winsorise all continuous variables at the 1% and 99% levels.

2.4.3. Descriptive statistics

Table 2.2 presents descriptive statistics of management earnings forecasts which are split into annual and quarterly forecasts. The difference in

Table 2.2 Descriptive Statistics of Management Earnings Forecasts

This table presents descriptive statistics of management earnings forecasts that have been issued between 2002–2012. The *t*-statistics for difference in mean and Wilcoxon *z*-statistics for difference in median are presented in brackets. *** denotes statistical significance at the 1% level. Variable definitions are provided in Table 2.1.

	Annual Forecasts			Quarterly Forecasts			All Forecasts			Difference in Mean	Difference in Median
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	(Annual - Quarterly)	(Annual - Quarterly)
Precision	2.115	2.000	0.491	2.122	2.000	0.484	2.119	2.000	0.486	-0.007	-0.000
										[-0.85]	[-0.79]
Accuracy	-30.208	-6.286	194.423	-8.409	-2.204	33.356	-15.820	-3.151	117.000	-21.799***	-4.081***
										[-10.78]	[-35.22]
Optimism	0.093	1.000	0.996	-0.049	-1.000	0.999	-0.001	-1.000	1.000	0.142***	2.000***
										[8.23]	[8.21]
Horizon	128.531	142.000	63.114	59.553	60.000	39.384	83.010	73.000	58.700	68.978***	82.000***
										[81.65]	[65.58]
#Obs.		9,801			5,049			14,850			

mean and median tests show that there is no significant difference in forecast precision between the two types of forecasts. However, the annual forecasts have lower accuracy, higher optimism and longer horizon than quarterly forecasts.

Table 2.3 presents descriptive statistics for the variables used in our regressions. The mean *Occurrence* is 0.654, 0.720 and 0.787 for annual forecasts, quarterly forecasts and all forecasts, respectively, suggesting that 65.4%, 72% and 78.7% of firm-year observations contain at least one respective forecast issuance. The mean forecast frequency is 0.850, 1.680 and 2.533 for annual forecasts, quarterly forecasts and all forecasts, respectively, suggestive of the prevalent forecast disclosure of Chinese firms. The 25th percentile of forecast precision is 2.00, 2.00 and 1.75 for annual forecasts, quarterly forecasts and all forecasts, respectively, which suggests the high propensity of Chinese firms to issue quantitative forecasts. The median forecast accuracy is –4.818 while the mean accuracy is –13.340, which suggests that the forecasts issued by certain firms or in certain years are extremely inaccurate. The mean *Optimism* is negative (–0.026) for all forecasts, indicating that management forecasts, on average, are pessimistically biased.

In addition, we observe that 16.3% of board secretaries have an accounting certificate and 32.3% of board secretaries are communist party members. Only 2.0% of board secretaries have a lawyer license, and 3.5% have foreign experience. Regarding the role duality, 26.9% of board

Table 2.3 Descriptive Statistics of Main Variables

This table presents descriptive statistics of management earnings forecast variables, board secretary characteristics, firm characteristics and firm outcome variables in the firm-year panel. Variable definitions are provided in Table 2.1.

Variable	#Obs.	Mean	Std. Dev.	Min	P25	Median	P75	Max
Annual Management Forecasts								
Occurrence	6,840	0.654	0.476	0.000	0.000	1.000	1.000	1.000
Frequency	6,840	0.850	0.750	0.000	0.000	1.000	1.000	3.000
Precision	4,471	1.827	0.804	0.000	2.000	2.000	2.000	3.000
Accuracy	3,839	-21.150	45.070	-311.700	-18.360	-6.511	-2.387	-0.054
Optimism	3,839	0.077	0.946	-1.000	-1.000	0.000	1.000	1.000
Ln(Horizon)	4,462	4.759	0.530	2.398	4.549	4.916	5.112	5.609
Pr(BadNews)	6,492	0.222	0.416	0.000	0.000	0.000	0.000	1.000
#BadNews	6,492	0.247	0.489	0.000	0.000	0.000	0.000	3.000
%BadNews	6,492	0.214	0.405	0.000	0.000	0.000	0.000	1.000
Quarterly Management Forecasts								
Occurrence	6,840	0.720	0.449	0.000	0.000	1.000	1.000	1.000
Frequency	6,840	1.680	1.298	0.000	0.000	2.000	3.000	5.000
Precision	4,922	1.837	0.776	0.000	2.000	2.000	2.000	3.000
Accuracy	4,267	-7.259	14.040	-105.800	-7.264	-2.863	-1.070	-0.018
Optimism	4,267	-0.053	0.846	-1.000	-1.000	0.000	1.000	1.000
Ln(Horizon)	4,906	3.984	0.649	1.792	3.738	4.190	4.511	4.736
All Management Forecasts								
Occurrence	6,840	0.787	0.410	0.000	1.000	1.000	1.000	1.000
Frequency	6,840	2.533	1.800	0.000	1.000	3.000	4.000	7.000
Precision	5,380	1.817	0.771	0.000	1.750	2.000	2.000	3.000
Accuracy	4,829	-13.340	27.530	-192.900	-12.270	-4.818	-1.846	-0.048
Optimism	4,829	-0.026	0.787	-1.000	-1.000	0.000	1.000	1.000
Ln(Horizon)	5,365	4.279	0.603	2.197	4.069	4.477	4.694	5.201

(Table 2.3 continued)

Variable	#Obs.	Mean	Std. Dev.	Min	P25	Median	P75	Max
Board Secretary Characteristics								
Law	6,840	0.020	0.139	0.000	0.000	0.000	0.000	1.000
Accounting	6,840	0.163	0.369	0.000	0.000	0.000	0.000	1.000
ForeignExp	6,840	0.035	0.169	0.000	0.000	0.000	0.000	1.000
PartyMeb	6,840	0.323	0.468	0.000	0.000	0.000	1.000	1.000
Board_Duality	6,840	0.269	0.443	0.000	0.000	0.000	1.000	1.000
CFO_Duality	6,840	0.082	0.274	0.000	0.000	0.000	0.000	1.000
Mag_Duality	6,840	0.408	0.492	0.000	0.000	0.000	1.000	1.000
EquityHold	6,834	2.086	3.942	0.000	0.000	0.000	0.000	13.800
Female	6,840	0.177	0.382	0.000	0.000	0.000	0.000	1.000
Age	6,840	40.550	7.010	23.000	35.000	40.000	45.000	71.000
Ln(Tenure)	6,840	6.939	1.059	3.091	6.433	7.170	7.687	8.490
Ln(Pay)	4,439	12.090	0.846	9.879	11.520	12.120	12.660	14.130
Turnover	5,398	0.142	0.349	0.000	0.000	0.000	0.000	1.000
Firm Characteristics								
BIndep	6,840	0.335	0.091	0.000	0.333	0.333	0.375	0.556
InstHold	6,840	0.170	0.189	0.000	0.021	0.096	0.265	0.742
GovHold	6,840	0.188	0.239	0.000	0.000	0.014	0.383	0.750
CR	6,840	0.584	0.150	0.229	0.477	0.603	0.704	0.868
Duality	6,840	0.203	0.402	0.000	0.000	0.000	0.000	1.000
BMeet	6,840	8.525	3.249	3.000	6.000	8.000	10.000	20.000
P/B	6,840	4.060	3.769	-5.750	1.970	3.125	5.000	24.340
Ln(Assets)	6,840	21.280	1.061	18.820	20.570	21.170	21.890	24.540
MBE	3,328	0.401	0.490	0.000	0.000	0.000	1.000	1.000
CMBE	2,512	0.195	0.396	0.000	0.000	0.000	0.000	1.000
Firm Outcomes								
MAO	5,773	0.081	0.273	0.000	0.000	0.000	0.000	1.000
SUE	4,829	0.060	0.237	0.000	0.000	0.000	0.000	1.000
Donation	4,084	1.496	4.394	0.000	0.000	0.000	0.000	19.600
CSR_Disclose	4,084	0.219	0.414	0.000	0.000	0.000	0.000	1.000
CapExp	5,730	0.390	0.616	-0.939	0.065	0.215	0.509	3.900
Opacity	6,172	0.118	0.189	0.001	0.024	0.057	0.122	1.205
ROA	6,830	0.036	0.065	-0.168	0.010	0.034	0.067	0.177
ROS	6,817	0.050	0.177	-0.675	0.017	0.054	0.117	0.396

secretaries are board members, 8.2% are CFOs, and 40.8% hold another senior post in the firm. More than 75% of board secretaries do not hold any equities of their firms.

2.5. Results

2.5.1. Board secretary characteristics and management forecast occurrence

In Table 2.4, we examine the effects of board secretaries' expertise, political connection, role duality and equity holding on management forecast occurrence by using annual forecasts, quarterly forecasts and all forecasts in Panels A, B and C, respectively.

The coefficients of *Law* are significantly positive in models 6, 10, 11 and 15, indicating that board secretaries with legal expertise are more likely to issue quarterly earnings forecasts. The coefficients of *Accounting* are significantly positive in models 1, 5, 6, 10, 11 and 15, indicating that board secretaries with accounting expertise are more likely to issue annual and quarterly earnings forecasts. The coefficients of *ForeignExp* are significantly positive in models 6 and 10, indicating that board secretaries with international experience are more likely to issue quarterly earnings forecasts. The results generally support the prediction that board secretaries with more expertise are more likely to issue forecasts, supporting the hypothesis H1.

The coefficients of *PartyMeb* are significantly negative in models 2, 5, 7 and 10 at the 5% level, suggesting an adverse effect of political connection on annual and quarterly earnings forecast issuance, consistent with the hypothesis H2.

Table 2.4 Board Secretary Characteristics and Management Forecast Occurrence

This table presents Probit regression results for the impact of board secretary characteristics on management forecast occurrence. The dependent variable is *Occurrence*, and all independent variables are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. Robust *z*-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Annual Forecasts					
DV=Forecast occurrence	(1)	(2)	(3)	(4)	(5)
Law	0.1795				0.1848
	[1.43]				[1.46]
Accounting	0.2106***				0.1573***
	[4.62]				[3.09]
ForeignExp	0.0614				0.0399
	[0.62]				[0.40]
PartyMeb		-0.0920**			-0.0851**
		[-2.52]			[-2.29]
Board_Duality			0.1182***		0.0992***
			[3.11]		[2.58]
CFO_Duality			0.2475***		0.1258*
			[3.82]		[1.74]
Mag_Duality			0.2229***		0.2082***
			[6.47]		[5.98]
EquityHold				0.0330***	0.0291***
				[7.77]	[6.69]
Controls	yes	yes	yes	yes	yes
pseudo R^2	0.098	0.096	0.104	0.101	0.11
N	6840	6840	6853	6847	6834
Panel B: Quarterly Forecasts					
DV=Forecast occurrence	(6)	(7)	(8)	(9)	(10)
Law	0.2955**				0.2845**
	[2.18]				[2.09]
Accounting	0.1979***				0.1520***
	[4.10]				[2.84]
ForeignExp	0.2315**				0.1947*
	[2.15]				[1.77]
PartyMeb		-0.0927**			-0.0787**
		[-2.46]			[-2.06]
Board_Duality			0.0431		0.0291
			[1.09]		[0.73]
CFO_Duality			0.2466***		0.1374*
			[3.55]		[1.78]
Mag_Duality			0.2580***		0.2413***
			[7.17]		[6.66]
EquityHold				0.0229***	0.0199***
				[5.25]	[4.44]
Controls	yes	yes	yes	yes	yes
pseudo R^2	0.106	0.104	0.112	0.106	0.116
N	6840	6840	6853	6847	6834

(Table 2.4 continued)

Panel C: All Forecasts					
DV=Forecast occurrence	(11)	(12)	(13)	(14)	(15)
Law	0.3532**				0.3326**
	[2.32]				[2.17]
Accounting	0.1612***				0.1294**
	[3.16]				[2.28]
ForeignExp	0.124				0.0971
	[1.09]				[0.84]
PartyMeb		-0.0547			-0.0456
		[-1.37]			[-1.13]
Board_Duality			0.0461		0.0326
			[1.10]		[0.77]
CFO_Duality			0.1906**		0.0976
			[2.57]		[1.19]
Mag_Duality			0.2089***		0.1950***
			[5.46]		[5.06]
EquityHold				0.0194***	0.0168***
				[4.19]	[3.55]
Controls	yes	yes	yes	yes	yes
pseudo R^2	0.108	0.106	0.111	0.108	0.114
N	6840	6840	6853	6847	6834

The coefficients of *Board_Duality*, *CFO_Duality* and *Mag_Duality* are significantly positive in models 3, 5, 8, 10, 13 and 15. These results suggest that board secretaries who are board members are more likely to issue annual earnings forecasts, and that board secretaries with an additional CFO or another senior executive title are more likely to issue both annual and quarterly earnings forecasts. These findings support the hypothesis H3.

Finally, the coefficients of *EquityHold* are significantly positive in models 4, 5, 9, 10, 14 and 15 at the 1% level, which indicates that board secretaries who hold shares of their firms are more likely to release annual and quarterly earnings forecasts to outside investors. This result supports the hypothesis H4.

2.5.2. Board secretary characteristics and management forecast frequency

In Table 2.5, we report the results for the effects of board secretary characteristics on management forecast frequency. We show that *Law*, *Accounting* and *ForeignExp* are positively associated with forecast frequency, indicating that the professional expertise of board secretaries improves earnings forecast frequency, supporting the hypothesis H1. *PartyMeb* is negatively related to forecast frequency, consistent with the hypothesis H2. *Board_Duality*, *CFO_Duality* and *Mag_Duality* are positively related to forecast frequency, lending support to the hypothesis H3. The coefficients of *EquityHold* are significantly positive in all models, which supports the hypothesis H4 that equity holdings provide incentives for board secretaries to make frequent forecast disclosures.

Table 2.5 Board Secretary Characteristics and Management Forecast Frequency

This table presents Poisson regression results for the impact of board secretary characteristics on management forecast frequency. The dependent variable is *Frequency*, and all independent variables are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. Robust z-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Annual Forecasts					
DV=Forecast frequency	(1)	(2)	(3)	(4)	(5)
Law	0.1501**				0.1514**
	[2.12]				[2.13]
Accounting	0.1054***				0.0769**
	[4.07]				[2.55]
ForeignExp	0.0731				0.0547
	[1.31]				[0.98]
PartyMeb		-0.0713***			-0.0632**
		[-2.81]			[-2.49]
Board_Duality			0.0629***		0.0615***
			[2.81]		[2.72]
CFO_Duality			0.1282***		0.0756**
			[4.06]		[2.04]
Mag_Duality			0.1219***		0.1190***
			[5.81]		[5.63]
EquityHold				0.0061***	0.0038*
				[2.80]	[1.74]
Controls	yes	yes	yes	yes	yes
pseudo R^2	0.024	0.024	0.026	0.024	0.026
N	6840	6840	6853	6847	6834
Panel B: Quarterly Forecasts					
DV=Forecast frequency	(6)	(7)	(8)	(9)	(10)
Law	0.1207**				0.1185**
	[2.37]				[2.28]
Accounting	0.0952***				0.0733***
	[4.32]				[2.90]
ForeignExp	0.1400***				0.1169***
	[3.30]				[2.76]
PartyMeb		-0.0484**			-0.0375*
		[-2.26]			[-1.75]
Board_Duality			0.0363*		0.0338*
			[1.89]		[1.75]
CFO_Duality			0.1247***		0.0766**
			[4.50]		[2.39]
Mag_Duality			0.1576***		0.1545***
			[8.84]		[8.64]
EquityHold				0.0052***	0.0031
				[2.70]	[1.59]
Controls	yes	yes	yes	yes	yes
pseudo R^2	0.045	0.044	0.048	0.045	0.049
N	6840	6840	6853	6847	6834

(Table 2.5 continued)

Panel C: All Forecasts					
DV=Forecast frequency	(11)	(12)	(13)	(14)	(15)
Law	0.1303***				0.1295***
	[2.86]				[2.78]
Accounting	0.0999***				0.0749***
	[4.88]				[3.19]
ForeignExp	0.1156***				0.0941**
	[2.86]				[2.33]
PartyMeb		-0.0574***			-0.0473**
		[-2.90]			[-2.40]
Board_Duality			0.0459***		0.0438**
			[2.61]		[2.48]
CFO_Duality			0.1277***		0.0778***
			[4.99]		[2.62]
Mag_Duality			0.1454***		0.1425***
			[8.93]		[8.71]
EquityHold				0.0055***	0.0033*
				[3.16]	[1.88]
Controls	yes	yes	yes	yes	yes
pseudo R^2	0.048	0.047	0.052	0.048	0.052
N	6840	6840	6853	6847	6834

2.5.3. Board secretary characteristics and management forecast precision

In Table 2.6, we report the results for the effects of board secretary characteristics on management forecast precision. We show that *Board_Duality*, *CFO_Duality* and *Mag_Duality* are significantly and positively associated with quarterly and annual forecast precision. The results suggest that board secretaries with role duality tend to employ their expanded power and superior resources to generate precise forecasts, which corroborates the hypothesis H3. In addition, *EquityHold* significantly increases the precision of quarterly earnings forecasts, lending some support to the hypothesis H4.

2.5.4. Board secretary characteristics and management forecast accuracy

We examine how board secretary characteristics impact the accuracy and optimism of management earnings forecasts.

Table 2.7 reports the results for forecast accuracy. We find that *Accounting* is significantly positively related to forecast accuracy in model 11. *CFO_Duality* and *Mag_Duality* are significantly positively associated with forecast accuracy in models 3, 5, 13 and 15, which supports the hypothesis H3. The role duality leads to board secretaries' concentrated power and information advantage. These board secretaries thus issue more accurate forecasts. Furthermore, we report a significantly positive relation between *Equityhold* and *Accuracy* in all models, supporting the hypothesis H4.

Table 2.6 Board Secretary Characteristics and Management Forecast Precision

This table presents OLS regression results for the impact of board secretary characteristics on management forecast precision. The dependent variable is *Precision*, and all independent variables except *Ln(Horizon)* are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. Robust *t*-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Annual Forecasts					
DV=Forecast precision	(1)	(2)	(3)	(4)	(5)
Law	0.0503				0.0484
	[0.60]				[0.58]
Accounting	0.0231				0.0127
	[0.90]				[0.42]
ForeignExp	0.0238				0.0127
	[0.40]				[0.21]
PartyMeb		0.0287			0.0294
		[1.08]			[1.09]
Board_Duality			0.0463**		0.0449*
			[2.02]		[1.94]
CFO_Duality			0.0653**		0.0603*
			[2.30]		[1.78]
Mag_Duality			0.1172***		0.1178***
			[5.50]		[5.51]
EquityHold				0.0013	-0.0003
				[0.70]	[-0.15]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.234	0.234	0.241	0.235	0.239
N	4462	4462	4468	4466	4460
Panel B: Quarterly Forecasts					
DV=Forecast precision	(6)	(7)	(8)	(9)	(10)
Law	0.0569				0.0583
	[0.83]				[0.85]
Accounting	0.0063				-0.0087
	[0.26]				[-0.30]
ForeignExp	0.0325				0.0201
	[0.58]				[0.36]
PartyMeb		0.0036			0.0024
		[0.15]			[0.10]
Board_Duality			0.0374*		0.0360*
			[1.81]		[1.73]
CFO_Duality			0.0539**		0.0605*
			[2.03]		[1.88]
Mag_Duality			0.1186***		0.1180***
			[6.13]		[6.08]
EquityHold				0.0031*	0.0014
				[1.83]	[0.81]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.257	0.257	0.262	0.256	0.263
N	4906	4906	4911	4909	4904

(Table 2.6 continued)

Panel C: All Forecasts					
DV=Forecast precision	(11)	(12)	(13)	(14)	(15)
Law	0.0277				0.0288
	[0.41]				[0.43]
Accounting	0.0165				0.0083
	[0.73]				[0.31]
ForeignExp	0.0376				0.0229
	[0.72]				[0.44]
PartyMeb		0.0038			0.0034
		[0.17]			[0.15]
Board_Duality			0.0353*		0.0341*
			[1.77]		[1.70]
CFO_Duality			0.0465*		0.0418
			[1.80]		[1.35]
Mag_Duality			0.1175***		0.1169***
			[6.41]		[6.34]
EquityHold				0.0025	0.0009
				[1.51]	[0.53]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.267	0.267	0.273	0.267	0.272
N	5365	5365	5371	5368	5362

Table 2.7 Board Secretary Characteristics and Management Forecast Accuracy

This table presents OLS regression results for the impact of board secretary characteristics on management forecast accuracy. The dependent variable is *Accuracy*, and all independent variables except *Ln(Horizon)* are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. Robust *t*-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Annual Forecasts					
DV=Forecast accuracy	(1)	(2)	(3)	(4)	(5)
Law	-4.8705				-4.6833
	[-0.87]				[-0.84]
Accounting	2.6248				1.1254
	[1.53]				[0.54]
ForeignExp	2.5047				3.065
	[0.82]				[0.98]
PartyMeb		0.9734			1.3449
		[0.54]			[0.76]
Board_Duality			-0.6074		-1.2196
			[-0.38]		[-0.75]
CFO_Duality			6.7386***		5.7522***
			[4.25]		[2.90]
Mag_Duality			4.1326***		3.8852***
			[2.92]		[2.71]
EquityHold				0.5682***	0.5393***
				[5.15]	[4.82]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.048	0.048	0.051	0.05	0.053
N	3834	3834	3838	3836	3832
Panel B: Quarterly Forecasts					
DV=Forecast accuracy	(6)	(7)	(8)	(9)	(10)
Law	-2.4163				-2.3045
	[-1.57]				[-1.62]
Accounting	0.2316				-0.0363
	[0.37]				[-0.06]
ForeignExp	-0.628				-0.452
	[-0.46]				[-0.40]
PartyMeb		0.2589			0.2829
		[0.50]			[0.55]
Board_Duality			-0.0345		-0.1904
			[-0.07]		[-0.39]
CFO_Duality			1.0924*		0.9751
			[1.80]		[1.40]
Mag_Duality			0.4815		0.4285
			[1.11]		[0.98]
EquityHold				0.1559***	0.1470***
				[4.27]	[3.92]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.075	0.075	0.075	0.077	0.077
N	4259	4259	4263	4261	4257

(Table 2.7 continued)

Panel C: All Forecasts					
DV=Forecast accuracy	(11)	(12)	(13)	(14)	(15)
Law	-4.0768				-3.8391
	[-1.35]				[-1.28]
Accounting	1.7979**				1.0766
	[1.97]				[1.03]
ForeignExp	1.7494				2.0087
	[1.27]				[1.44]
PartyMeb		0.2997			0.5548
		[0.32]			[0.59]
Board_Duality			-0.5849		-0.9649
			[-0.65]		[-1.07]
CFO_Duality			3.6355***		2.6697**
			[3.51]		[2.27]
Mag_Duality			2.1150***		1.9009**
			[2.75]		[2.44]
EquityHold				0.3834***	0.3672***
				[6.05]	[5.67]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.061	0.06	0.062	0.063	0.065
N	4821	4821	4825	4822	4818

Table 2.8 reports the results for forecast optimism. *Board_Duality* and *Mag_Duality* are significantly positively related to forecast optimism in models 9, 13 and 15. The results reveal that board secretaries who serve as board members or non-accounting senior executives issue more optimistically biased quarterly earnings forecasts – that is, the forecast earnings released by board secretaries tend to exceed actual earnings. The results also suggest that board secretaries with higher hierarchical status within firms, as evidenced by their role duality, tend to overestimate firm profitability and issue more optimistic future earnings estimates. In addition, we document significantly positive coefficients on *EquityHold*, suggesting that board secretaries with more equity holdings issue more optimistically biased forecasts. This could result from the self-serving tendency of board secretaries.

Table 2.8 Board Secretary Characteristics and Management Forecast Optimism

This table presents OLS regression results for the impact of board secretary characteristics on management forecast optimism. The dependent variable is *Optimism*, and all independent variables except *Ln(Horizon)* are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. Robust *t*-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Annual Forecasts					
DV=Forecast optimism	(1)	(2)	(3)	(4)	(5)
Law	0.0018				0.0076
	[0.02]				[0.07]
Accounting	0.0418				0.0408
	[1.07]				[0.92]
ForeignExp	0.1016				0.1134
	[1.20]				[1.34]
PartyMeb		0.0032			0.0084
		[0.09]			[0.23]
Board_Duality			0.0528		0.0486
			[1.56]		[1.42]
CFO_Duality			0.0286		0.0045
			[0.59]		[0.08]
Mag_Duality			0.0101		0.0083
			[0.32]		[0.27]
EquityHold				0.0064*	0.0059*
				[1.84]	[1.67]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.026	0.026	0.026	0.027	0.026
N	3834	3834	3838	3836	3832
Panel B: Quarterly Forecasts					
DV=Forecast optimism	(6)	(7)	(8)	(9)	(10)
Law	-0.037				-0.0319
	[-0.43]				[-0.37]
Accounting	0.0197				-0.0025
	[0.58]				[-0.06]
ForeignExp	0.0192				0.0273
	[0.27]				[0.38]
PartyMeb		-0.0129			-0.0134
		[-0.42]			[-0.44]
Board_Duality			0.0705**		0.0642**
			[2.44]		[2.21]
CFO_Duality			0.0571		0.0529
			[1.36]		[1.10]
Mag_Duality			0.0448*		0.0413
			[1.69]		[1.56]
EquityHold				0.0082***	0.0068**
				[2.69]	[2.21]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.028	0.028	0.03	0.03	0.03
N	4259	4259	4263	4261	4257

(Table 2.8 continued)

Panel C: All Forecasts					
DV=Forecast optimism	(11)	(12)	(13)	(14)	(15)
Law	-0.0227				-0.0161
	[-0.31]				[-0.22]
Accounting	0.0441				0.0318
	[1.49]				[0.94]
ForeignExp	0.0683				0.0757
	[1.08]				[1.20]
PartyMeb		-0.0092			-0.0076
		[-0.35]			[-0.29]
Board_Duality			0.0707***		0.0645**
			[2.81]		[2.55]
CFO_Duality			0.0524		0.0283
			[1.42]		[0.67]
Mag_Duality			0.0412*		0.0382*
			[1.79]		[1.65]
EquityHold				0.0087***	0.0075***
				[3.29]	[2.80]
Controls	yes	yes	yes	yes	yes
Adj. R^2	0.037	0.037	0.039	0.039	0.04
N	4821	4821	4825	4822	4818

2.6. Additional analyses

2.6.1. Board secretary characteristics and bad news versus good news management forecasts

Compared to good news forecasts, managers have more incentives to issue bad news forecasts because this can reduce their legal and reputation costs (Skinner 1994; Heflin *et al.* 2016). Since board secretaries have important legal and regulatory duties, they could face great litigation risks if they made irresponsible forecast disclosures. Thus, the characteristics of board secretaries should have an impact on bad news issuance.

Following Heflin *et al.* (2016), we classify a management forecast as a bad (good) news forecast, if the management forecast is lower (higher) than the most recent consensus analyst forecast, where the consensus forecast is identified as the median analyst forecast issued within 180 days prior to the management forecast disclosure date. We collect analyst forecast data from the CSMAR database. Since only annual analyst earnings forecasts are available in CSMAR, our analysis on bad news versus good news management forecasts uses the annual forecasts only.

We study three different properties of bad news management forecasts. *Pr(Bad news)* is a dummy variable equal to 1 if the firm issues at least one bad news management forecast in a given year, and 0 otherwise. *#Bad news* is the number of bad news management forecasts issued by a firm in a given year. *%Bad news* is the fraction of management earnings forecasts that

convey bad news. If there is no management forecast issuance in a firm-year, then *Pr(Bad news)*, *#Bad news* and *%Bad news* are set to 0.

Table 2.9 presents the regression results for the impact of board secretary characteristics on bad news management forecasts. We estimate Probit regressions for the dependent variable of *Pr(Bad news)*, Poisson regressions for *#Bad news*, and OLS regressions for *%Bad news*. The coefficients of *Accounting* are significantly positive in models 1 and 11, which suggests that board secretaries with accounting expertise are more likely to issue bad news forecasts. The coefficients of *PartyMeb* are negatively significant, which indicates that political connection reduces board secretaries' willingness to release bad news forecasts. The coefficients of *Board_Duality*, *CFO_Duality*, *Mag_Duality* and *EquityHold* are significantly positive, suggesting that board secretaries who have dual roles and equity holdings make more frequent bad news forecast disclosures.

2.6.2. Management earnings forecasts and board secretary pay

Management earnings forecast quality reflects managers' ability to adapt future production plans in response to foreseeable changes in business environments (Trueman 1986; Baik *et al.* 2011; Yang 2012). Lee *et al.* (2012) further show that underperforming CEOs are more likely to be replaced when their firms produce less accurate earnings forecasts. These studies suggest that management earnings forecast quality signifies managerial ability.

Board secretaries have duties to reduce information asymmetry between corporate insiders and outside investors by ensuring adequate and accurate

Table 2.9 Board Secretary Characteristics and Bad News Management Forecasts

This table presents regression results for the impact of board secretary characteristics on bad news management forecast disclosure. Panel A reports Probit regression results on the occurrence of bad news management forecasts (*Pr(BadNews)*), Panel B reports Poisson regression results on the frequency of bad news management forecasts (*#BadNews*), and Panel C reports OLS regression results on the fraction of management forecasts that convey bad news (*%BadNews*). All independent variables are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. Robust *t*(*z*)-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Dependent variable = Pr(BadNews)					
	(1)	(2)	(3)	(4)	(5)
Law	-0.0494				-0.0434
	[-0.40]				[-0.35]
Accounting	0.1190**				0.0679
	[2.53]				[1.25]
ForeignExp	0.033				0.0264
	[0.32]				[0.26]
PartyMeb		-0.1182***			-0.1094***
		[-2.94]			[-2.68]
Board_Duality			0.0732*		0.0383
			[1.85]		[0.95]
CFO_Duality			0.2224***		0.1472**
			[3.59]		[2.05]
Mag_Duality			0.2763***		0.2563***
			[7.72]		[7.06]
EquityHold				0.0393***	0.0359***
				[8.90]	[7.97]
Controls	yes	yes	yes	yes	yes
R^2	0.144	0.145	0.153	0.154	0.163
N	6840	6840	6853	6847	6834
Panel B: Dependent variable = #BadNews					
	(6)	(7)	(8)	(9)	(10)
Law	-0.053				-0.0764
	[-0.37]				[-0.51]
Accounting	0.079				0.0376
	[1.57]				[0.64]
ForeignExp	0.0153				0.0207
	[0.15]				[0.20]
PartyMeb		-0.1328***			-0.1253**
		[-2.67]			[-2.52]
Board_Duality			0.0923**		0.055
			[2.16]		[1.28]
CFO_Duality			0.1966***		0.1333*
			[3.25]		[1.88]
Mag_Duality			0.3058***		0.2820***
			[7.52]		[6.86]
EquityHold				0.0328***	0.0285***
				[8.04]	[6.76]
Controls	yes	yes	yes	yes	yes
R^2	0.096	0.096	0.102	0.101	0.106
N	6840	6840	6853	6847	6834

(Table 2.9 continued)

Panel C: Dependent variable = %BadNews					
	(11)	(12)	(13)	(14)	(15)
Law	-0.0282				-0.0247
	[-0.84]				[-0.74]
Accounting	0.0355**				0.0211
	[2.50]				[1.33]
ForeignExp	0.0077				0.0067
	[0.24]				[0.21]
PartyMeb		-0.0288***			-0.0267**
		[-2.71]			[-2.53]
Board_Duality			0.0243**		0.014
			[2.11]		[1.22]
CFO_Duality			0.0623***		0.0361
			[3.03]		[1.58]
Mag_Duality			0.0755***		0.0679***
			[7.15]		[6.41]
EquityHold				0.0140***	0.0129***
				[9.66]	[8.76]
Controls	yes	yes	yes	yes	yes
R^2	0.148	0.148	0.156	0.162	0.168
N	6840	6840	6853	6847	6834

forecast disclosure. Since investors may favourably evaluate firms that have frequent forecast issuance and high forecast precision and accuracy, these firms that benefit from improved forecast disclosure are likely to reward their board secretaries. Thus, we predict that board secretaries' pay is positively related to the occurrence, frequency, precision and accuracy of management forecasts. We construct the variable *Ln(Pay)* as the natural logarithm of the sum of the board secretary's salary and bonus.

Table 2.10 presents the regressions of board secretary pay on management earnings forecast properties.[7] In Panel A, we use the OLS estimator. We observe in model 1 that the coefficient of *Occurrence* is significantly positive at the 1% level, which reveals that board secretaries involved in forecast disclosure receive higher pay. In models 2–6, where at least one forecast issuance occurs in the firm-year, the coefficients of *Frequency*, *Precision*, *Accuracy* and *%BadNews* are significantly positive, consistent with the notion that board secretaries who issue high-quality forecasts are better remunerated. The coefficient of *Optimism* is significantly negative, which suggests that board secretaries who issue less optimistically biased forecasts earn more. Furthermore, board secretaries with foreign experience, role duality and equity holdings tend to receive higher pay, while board secretaries with party membership have lower pay.

[7] Since board secretary pay and replacement should be more related to the overall forecast quality, we use the all forecast sample, without dividing it into annual and quarterly forecasts.

Table 2.10 Management Earnings Forecasts and Board Secretary Pay

This table presents regression results for the impact of management earnings forecast properties on board secretary pay. The dependent variable is *Ln(Pay)*, and all independent variables are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. In the dynamic OLS regressions, the one-year lagged *Ln(Pay)* is included as an additional control variable, and robust *t*-statistics are provided in brackets. In the dynamic panel system GMM estimation, all independent variables are treated as endogenous except for crisis and industry dummies, and these endogenous variables are then instrumented by three of their past values; the *t*-statistics based on finite-sample corrected robust standard errors (Windmeijer 2005) are provided in brackets. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: OLS							
DV = Pay	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Occurrence	0.0792***						
	[3.04]						
Frequency		0.0180***					0.0156
		[2.82]					[1.49]
Precision			0.1830***				0.1691***
			[10.09]				[7.06]
Accuracy				0.0023***			0.0017***
				[4.77]			[3.58]
Optimism					-0.0744***		-0.0632***
					[-4.24]		[-3.64]
%BadNews						0.1623***	0.1297***
						[6.16]	[4.36]
Controls	yes	yes	yes	yes	yes	yes	yes
Adj. R^2	0.300	0.300	0.328	0.305	0.304	0.304	0.328
N	4405	4405	3341	2823	2823	4405	2823
Panel B: Dynamic OLS							
DV = Pay	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Occurrence	0.0175						
	[0.96]						
Frequency		0.0015					-0.001
		[0.33]					[-0.15]
Precision			0.0364***				0.0312*
			[2.60]				[1.93]
Accuracy				0.0008**			0.0006*
				[2.03]			[1.66]
Optimism					-0.0341***		-0.0303***
					[-2.92]		[-2.62]
%BadNews						0.0127	0.0157
						[0.69]	[0.82]
Ln(Pay)_Lag1	0.7858***	0.7861***	0.7749***	0.7818***	0.7825***	0.7856***	0.7766***
	[57.06]	[57.14]	[48.14]	[45.97]	[46.06]	[56.85]	[40.57]
Controls	yes	yes	yes	yes	yes	yes	yes
Adj. R^2	0.702	0.702	0.694	0.702	0.702	0.702	0.703
N	3865	3865	2996	2595	2595	3865	2595

(Table 2.10 continued)

Panel C: Dynamic Panel GMM							
DV = Pay	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Occurrence	0.2392**						
	[2.46]						
Frequency		0.0206					0.0192
		[1.13]					[1.38]
Precision			0.1293**				0.0911***
			[2.51]				[2.82]
Accuracy				0.0017**			0.0014**
				[2.42]			[2.11]
Optimism					-0.0739**		-0.0601**
					[-2.51]		[-2.20]
%BadNews						0.018	0.0141
						[0.46]	[0.34]
Ln(Pay)_Lag1	0.4587***	0.4847***	0.4049***	0.5886***	0.5998***	0.6818***	0.5612***
	[8.86]	[9.39]	[7.15]	[11.69]	[13.54]	[17.39]	[11.41]
Controls	yes	yes	yes	yes	yes	yes	yes
N	3865	3865	2996	2595	2595	3865	2595

The issues of reverse causality and omitted variables may plague our results. Following Wintoki *et al.* (2012), we control for the link between *current* management forecast properties and *past* board secretary pay by using a dynamic model with lagged board secretary pay as a regressor. The dynamic model can at least partially control for such reverse causality and capture the potential dynamic pattern in board secretary compensation arrangements.

In Panel B of Table 2.10, we include the one-year lagged board secretary pay as a regressor, and this dynamic model is estimated in OLS regressions. We find that board secretaries' current pay is positively and significantly related to their past pay. The dynamic model complements our static model statistically as well as economically. The adjusted R^2 rises from 30% in the static model to 70% in the dynamic model, which suggests that past pay explains a large portion of variation of the current pay.

Despite controlling for this dynamic relation, our results may still suffer from firm-level omitted variable bias. Wintoki *et al.* (2012) argue that in the presence of a dynamic relation, simply using firm-level fixed effects to alleviate this endogeneity concern may produce biased results, as fixed effects estimation is powerful under an assumption that past values of the dependent variable have no impact on current values of independent variables. Wintoki *et al.* (2012) further suggest that the dynamic panel system generalised method of moments (GMM) estimator proposed by Arellano and Bover (1995) can account for the dynamic nature of the model as well as control for time-invariant unobserved firm-level heterogeneity. Thus, following Dezsö and Ross (2012) and Adams and Ferreira (2009), we employ the dynamic panel system

GMM estimator to reduce reverse causality and time-invariant omitted variable biases. The results in Panel C of Table 2.10 show that board secretaries receive higher pay by providing management earnings forecasts of higher precision, higher accuracy and lower optimism.[8]

2.6.3. Management earnings forecasts and board secretary turnover

Firms could employ management earnings forecast quality to evaluate board secretaries' ability and performance when making replacement decisions. We examine the effect of management forecast quality on board secretary turnover. We construct the dummy variable, *Turnover*, which is equal to 1 if there is a board secretary turnover in a given firm-year, and 0 otherwise.

In Table 2.11, we regress board secretary turnover on management forecast properties. In Panel A, we estimate Probit regressions. The coefficients of *Accuracy* are significantly negative, indicating that board secretaries who issue more accurate forecasts are less likely to be replaced. The results corroborate the finding of Lee *et al.* (2012) that management forecast errors increase managerial turnover. The results based on the dynamic linear probability model in Panel B of Table 2.11 show that there is a

[8] The GMM instruments tests can be further added to validate the model specification. The *AR(1)* and *AR(2)* tests are used to examine whether sufficient lags of the dependent variable have been included to make the model dynamically complete, and the Hansen *J* test of over-identification is used to examine whether all instruments are exogenous.

Table 2.11 Management Earnings Forecasts and Board Secretary Turnover

This table presents regression results for the impact of management earnings forecast properties on board secretary turnover. The dependent variable is *Turnover*, and all independent variables are lagged by one year relative to the dependent variable. Control variables and industry dummies are included but suppressed for brevity. In the dynamic linear probability model, the one-year and two-year lagged *Turnover* variables are included as additional control variables, and robust *z*-statistics are provided in brackets. In the dynamic panel system GMM estimation, all independent variables are treated as endogenous except for crisis and industry dummies, and these endogenous variables are then instrumented by two of their past values; the *t*-statistics based on finite-sample corrected robust standard errors (Windmeijer 2005) are provided in brackets. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

Panel A: Probit							
DV = Turnover	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Occurrence	0.1436***						
	[2.73]						
Frequency		0.0238*					0.002
		[1.86]					[0.09]
Precision			-0.0843***				0.0256
			[-2.64]				[0.56]
Accuracy				-0.0019**			-0.0019**
				[-2.24]			[-2.15]
Optimism					0.0257		0.018
					[0.72]		[0.51]
%BadNews						-0.0641	-0.0363
						[-1.06]	[-0.54]
Controls	yes	yes	yes	yes	yes	yes	yes
R^2	0.020	0.019	0.019	0.015	0.013	0.019	0.015
N	5398	5398	3928	3130	3130	5398	3130
Panel B: Dynamic Linear Probability Model							
DV = Turnover	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Occurrence	0.0248**						
	[2.21]						
Frequency		0.0041					-0.0002
		[1.35]					[-0.03]
Precision			-0.0230***				0.0027
			[-2.90]				[0.26]
Accuracy				-0.0005**			-0.0005*
				[-2.03]			[-1.96]
Optimism					0.0054		0.0036
					[0.66]		[0.44]
%BadNews						-0.0182	-0.0063
						[-1.31]	[-0.42]
Turnover_Lag1	-0.0068	-0.0066	0.0025	0.0084	0.0109	-0.0058	0.0076
	[-0.30]	[-0.30]	[0.09]	[0.28]	[0.36]	[-0.26]	[0.25]
Turnover_Lag2	0.03	0.0301	0.0448**	0.0510**	0.0534**	0.0313*	0.0506**
	[1.59]	[1.60]	[2.04]	[2.17]	[2.26]	[1.66]	[2.15]
Controls	yes	yes	yes	yes	yes	yes	yes
R^2	0.012	0.012	0.011	0.006	0.004	0.012	0.004
N	4886	4886	3569	3045	3045	4886	3045

(Table 2.11 continued)

Panel C: Dynamic Panel GMM							
DV = Turnover	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Occurrence	0.0368						
	[1.11]						
Frequency		-0.0084					0.0011
		[-1.05]					[0.09]
Precision			-0.0223				0.0261
			[-1.49]				[1.40]
Accuracy				-0.0012**			-0.0009*
				[-2.22]			[-1.70]
Optimism					0.0319		0.0265
					[1.59]		[1.40]
%BadNews						-0.0752**	-0.0533
						[-2.19]	[-1.47]
Turnover_Lag1	-0.0094	-0.0002	-0.1033	-0.1480*	-0.1373*	-0.0142	-0.1674**
	[-0.16]	[-0.00]	[-1.56]	[-1.95]	[-1.75]	[-0.23]	[-2.07]
Turnover_Lag2	0.0236	0.0218	0.0062	0.0128	0.018	0.0247	0.0162
	[1.00]	[0.95]	[0.22]	[0.45]	[0.61]	[1.04]	[0.54]
Controls	yes	yes	yes	yes	yes	yes	yes
N	4886	4886	3569	3045	3045	4886	3045

dynamic relation in board secretary turnover.[9] The dynamic panel system GMM estimation results in Panel C provide further support for the argument that higher forecast accuracy leads to a lower likelihood of board secretary turnover.

Since board secretaries are appointed by the board of directors and report directly to the board, they are likely to be replaced during the routine board turnover. As a robustness test, we create a new sample that includes only the firm-years during which the boards are routinely replaced. Using this restricted sample, the untabulated results show that the newly appointed boards of directors are likely to retain former board secretaries if these secretaries issue accurate forecasts.

2.6.4. Board secretary characteristics and firm outcomes

Board secretaries are members of the TMT. They could have an impact on other corporate issues, such as auditing quality, lawsuits, corporate social responsibility, financial policy, earnings quality and firm performance. To test for this prediction, we construct the following variables. Modified auditor opinion (*MAO*) is equal to 1 if a modified auditor opinion is issued to a firm, and 0 otherwise. Lawsuit (*SUE*) is equal to 1 if there is a lawsuit issued against a firm, and 0 otherwise. Corporate social responsibility is measured by the

[9] A limitation of dynamic linear probability model is that a predicted probability from this model can be either less than zero or greater than one. However, a probability should be bounded within this range. Another limitation is that the residual is not normally distributed. The commonly used *t* test, which is based on normal distributions, can cause biases with respect to inference in small samples.

following two variables. *Donation* is the natural logarithm of social donations (in Chinese RMB). *CSR* is equal to 1 if a firm releases its corporate social responsibility strategy in its annual report, and 0 otherwise. As a proxy for corporate financial policies, capital expenditure (*CapExp*) is the ratio of capital expenditure to cash flow. Earnings quality is measured by *Opacity*, which equals the absolute value of discretionary accruals calculated using Dechow and Dichev's (2002) model. Firm performance is measured by return on assets (*ROA*) and return on sales (*ROS*).

Table 2.12 presents the regression results for the impact of board secretary characteristics on firm-level outcomes. In model 1, the result shows that the issuance of modified auditor opinions is positively associated with the duality director role of board secretaries, and negatively associated with their duality CFO role and equity holdings. In model 2, the result shows that firms whose board secretaries hold the firms' stock have lower litigation risks. In model 3, board secretaries with accounting expertise and equity holdings are associated with more corporate donations. Model 4 shows that firms whose board secretaries are politically connected are less engaged in socially responsible corporate activities. In model 5, the result indicates that the foreign experience and the party membership of board secretaries reduce firms' capital expenditure, while their equity holdings increase it. In model 6, the result suggests that firms are more likely to manipulate earnings when board secretaries have role duality. Models 7 and 8 suggest that board secretaries' equity holdings are positively associated with firm performance.

Table 2.12 Board Secretary Characteristics and Firm Outcomes

This table presents regression results for the impact of board secretary characteristics on firm outcomes, including the release of modified auditor opinions (*MAO*), lawsuits against firms (*SUE*), social donations (*Donation*), corporate social responsibility (*CSR*), capital expenditure (*CapExp*), earnings opacity (*Opacity*) and firm performance (*ROA* and *ROS*). All independent variables are lagged by one year relative to the dependent variable. Models 1, 2 and 4 are Probit regressions, while the other models are OLS regressions. Control variables and industry dummies are included but suppressed for brevity. Robust *t*(*z*)-statistics are provided in brackets below each coefficient. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are provided in Table 2.1.

DV=	*MAO*	*SUE*	*Donation*	*CSR*	*CapExp*	*Opacity*	*ROA*	*ROS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Law	-0.0197	-0.322	0.823	-0.0278	0.0691	-0.0187	-0.002	-0.0025
	[-0.10]	[-1.26]	[1.27]	[-0.12]	[0.81]	[-1.00]	[-0.28]	[-0.12]
Accounting	0.1651	-0.0625	0.5246*	0.0783	0.0207	0.0117	-0.0027	-0.0073
	[1.49]	[-0.59]	[1.78]	[0.68]	[0.64]	[1.40]	[-0.76]	[-0.74]
ForeignExp	-0.0043	0.2215	-0.3514	0.0396	-0.1114**	0.0111	0.0018	-0.0037
	[-0.02]	[1.00]	[-0.67]	[0.18]	[-2.46]	[0.73]	[0.28]	[-0.22]
PartyMeb	-0.0522	0.0235	-0.2243	-0.2026**	-0.0497**	-0.003	-0.0026	-0.0067
	[-0.60]	[0.32]	[-1.08]	[-2.17]	[-2.09]	[-0.61]	[-0.98]	[-0.93]
Board_Duality	0.1583**	0.0008	-0.0748	-0.048	-0.0279	0.0119**	-0.0004	-0.0046
	[2.08]	[0.01]	[-0.39]	[-0.52]	[-1.21]	[2.06]	[-0.15]	[-0.72]
CFO_Duality	-0.2539*	-0.1027	-0.4154	-0.1261	0.039	-0.0057	0.0049	0.014
	[-1.75]	[-0.54]	[-1.18]	[-0.83]	[0.79]	[-0.52]	[1.04]	[1.23]
Mag_Duality	-0.1032	0.0601	0.2655	0.1233	0.0265	0.0105**	0.0024	0.0064
	[-1.48]	[0.83]	[1.63]	[1.52]	[1.16]	[2.07]	[1.07]	[1.14]
EquityHold	-0.0403***	-0.0236*	0.0484**	0.0135	0.0081***	-0.0014**	0.0018***	0.0037***
	[-3.66]	[-1.89]	[2.11]	[1.52]	[2.83]	[-2.21]	[6.61]	[6.23]
Controls	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.13	0.097	0.157	0.219	0.048	0.105	0.117	0.072
N	6825	4823	4084	4084	5724	6166	6824	6811

2.7. Conclusion

Considerable research has studied the influence of CEOs, CFOs and General Counsels on management forecast disclosure, but that of board secretary, an important senior position responsible for information disclosure to regulators, investors and financial analysts, has been largely ignored. Board secretaries' performance in forecast disclosure could have significant implications for the information transmission between inside managers and outside investors. This study investigates the effects of board secretaries' expertise, political connections, role duality and equity holdings on management earnings forecasts. Our results suggest that the quality of management earnings forecasts is positively associated with the legal expertise, accounting expertise, foreign experience, role duality and equity holdings of board secretaries, and negatively related to their communist party membership.

In addition, board secretaries with accounting expertise, role duality and equity holdings tend to issue bad news forecasts. Firms may make compensation and replacement decisions for board secretaries based on their performance in forecast disclosure. Specifically, board secretaries receive higher pay and are less likely to be replaced when they deliver higher quality forecasts to the public. Our further results provide evidence that board secretaries play an important role in corporate governance, business ethics, corporate investment and performance.

Chapter 3

Does Gender Interaction Enhance or Impede Firm Performance?

3.1. Introduction

The issue of gender diversity in corporate leadership has received mounting attention from regulators worldwide. In 2003, Norway mandated a mandatory quota requiring female representation on boards of public firms to reach 40% by 2008. Since then, a growing number of developed countries, such as Spain, Iceland, Finland and France, have proposed such policies or introduced similar gender-related governance codes to promote gender diversity within firms. Among developing countries, China has witnessed a steadily rising number of women taking up director or senior executive positions. In 2000, only 9% of directors, 4% of CEOs and 18% of CFOs were women, while the ratios ascended to 14%, 6% and 33%, respectively, in 2014.

Prior research on the relation between gender diversity and firm outcomes has assessed either board gender diversity or the gender of senior executives (e.g., Adams & Ferreira 2009; Huang & Kisgen 2013; Cumming *et al.* 2015; Francis *et al.* 2015). There is rather limited evidence on whether the gender interaction between the board of directors and the top management team has an effect on firm outcomes. Given the influential roles of CEOs and CFOs in management, I define them as top managers and then examine the gender interaction effect between female top managers and female board directors. I

argue that, due to the minority status of women in the top corporate hierarchy and their higher pressure to perform well, gender interaction among women could take place, leading to measurable effects at the firm level.

The seminal work of Matsa and Miller (2011) shows that firms with more women on board tend to add more women to its top management team. They argue that this finding 'presents evidence of women helping women in corporate America' (p. 635). This is also consistent with anecdotal evidence. Sheri McCoy, a businesswoman, worked as the CEO of Avon Products Inc. during 2012–2017. It was striking to notice that during this period out of eleven directors on the board, seven were women.[10]

In this chapter, I posit that the gender interaction between female top managers and female board directors can influence firm performance in two competing ways. On the one hand, it could impair firm performance. According to agency theory (Fama & Jensen 1983), the board of directors functions to reduce the agency conflicts between managers and shareholders. Board independence is crucial to this monitoring mechanism (Rosenstein & Wyatt 1990). The gender interaction, in a sense, connects the board to the management, which could undermine the effectiveness of board oversight and hurt firm performance. On the other hand, it could improve firm performance. Due to the gender interaction, female top managers are likely to receive extra expert advice and support from female board directors, which ultimately improves firms' operational efficiency. In addition, the high female

[10] This is well above the industry median.

representation on the board can cultivate a female-friendly corporate culture (Matsa & Miller 2011; Tate & Yang 2015) and thus may motivate female top managers to perform.

China offers me a unique opportunity to study the gender interaction effect for at least two reasons. First, in China, a large number of female professionals have broken the glass ceiling rising to the top corporate positions. The representation of women is considerably higher than that in U.S. and European firms, which allows for a larger variation in gender-related variables that can be employed to identify, if present, a gender interaction effect.[11] Simply put, it is impossible to study gender-related issues if there are no women in these roles. Second, because of the one-child policy in China, women are likely to have as many opportunities as men in terms of education and upbringing (Tsui & Rich 2002), which could reduce social prejudice against women. It is less likely that women in corporate China are mere tokens, which enables me to circumvent the challenge of dealing with the tokenism issue in current studies that use U.S. or European data (e.g., Lee & James 2007; Ahern & Dittmar 2012; Matsa & Miller 2013).

Using a sample of Chinese listed firms, I find evidence that the gender interaction between the presence of female top managers and the fraction of women on board is positively associated with return on assets (ROA). If the

[11] The differences between China and the U.S. in women's occupancy in senior positions are striking. Between 2000 and 2014, women occupied 11% of board seats, 25.6% of CFO roles, and 4.9% of CEO roles in listed firms of China. By contrast, in U.S. listed firms, women occupied 10% of board seats, 8% of CFO positions and 2% of CEO positions.

higher ROA accompanying women's interaction represented enhanced operating efficiency, then an intuitive expectation would be that the stock market responded positively to the appointment of female top managers to firms that have female directors on board. Surprisingly, contrary to my intuition, the empirical results show that the appointment of female CEOs leads to more negative short-term cumulative abnormal returns (CARs) in firms with a higher ratio of female board representation. This suggests that the gender interaction could be unfavourable to stock investors.

I decompose female directors into female executive directors and female independent directors. I find that the opposite effects of female interaction on accounting profitability and stock prices pertain to female *executive* directors only, while the effects are statistically insignificant when examining female *independent* directors. The results indicate that the gender interaction requires women's managerial power in order to exert an impact at the firm level.

Collectively, my results reveal that stock investors tend to interpret female interaction as an unfavourable practice and react negatively as a result, although the firm's accounting returns improve. It is noteworthy that ROA is a backward-looking measure and can be distorted by adoption of various financial policies and, more critically, by earnings manipulation practices (Burgstahler & Dichev 1997). I show that in my data, earnings management increases ROA, in line with the argument of Dechow *et al.* (1995) that use of discretionary accruals is a major way for managers to manipulate earnings. Further, I show that the gender interaction between female top managers and female board directors increases earnings management. I thus propose one

possible explanation for my results: the gender interaction could induce earnings manipulation, which inflates accounting returns but in fact hurts shareholders' interests, leading to declining stock prices.

Finally, I find that the gender interaction has significant effects on ROA and earnings management only when the female top managers start their top managerial role. The effects disappear when the female top managers hold their role for more than one year. The results provide some evidence that women holding the posts for longer periods are likely to be entrenched in the firms and experience lower performance pressure; as a result, they would have less need to disguise their performance though earnings manipulation. To further justify this contention, I examine the long-run stock market reactions to female CEO appointments. I find that only the one-year post-appointment buy-and-hold (B&H) returns are negative and significant, while the two- and three-year post-appointment B&H returns are statistically insignificant. Jointly, the results indicate that because female top managers are likely to face strong performance pressure during their initial year in leadership, they collaborate with female directors to sugar-coat their performance via earnings manipulation, which induces unfavourable stock price movements.

This chapter contributes to the existing literature in three major ways. First, it bridges two strands of literature on the gender diversity of corporate board and the gender issue of top management team. My results reveal that women's representation in the firm should go beyond the board level in order for gender diversity to make an impact on firm outcomes. My study is closely related to Amore *et al.* (2014), who examine private, family firms in Italy and document a

positive effect of the gender interaction between top managers and board directors on ROA. Since a market-based performance measure is unavailable for these private firms, my study for Chinese public firms unveils a key undocumented feature: gender interaction leads to a short-lived increment in ROA, but this is a result of earnings management, which ultimately makes a detrimental impact on stock prices.

Second, this chapter complements the literature on gender diversity within firms. It has been shown that gender diversity influences a variety of firm policies and outcomes, including profitability (Ahern & Dittmar 2012; Dezsö & Ross 2012; Matsa & Miller 2013; Liu *et al.* 2014), corporate governance (Adams & Ferreira 2009; Beck *et al.* 2013), risk avoidance (Faccio *et al.* 2016), acquisitions (Levi *et al.* 2014), earnings quality (Srinidhi *et al.* 2011; Francis *et al.* 2015) and stock price informativeness (Gul *et al.* 2011). I also contribute to the general literature on diversity. This body of literature has documented that firm performance is related to different forms of diversity, including racial diversity (Richard 2000; Richard *et al.* 2004), cognitive diversity (Kilduff *et al.* 2000) and top management team heterogeneity (Pegels *et al.* 2000; Carpenter 2002).

Third, this chapter adds to gender-related studies by showing that the interaction among women affects firm performance only when women have managerial power. Only the gender interaction between female top managers and female *executive* directors has a significant effect on firm performance, whereas the gender interaction as regards female *independent* directors has no such effect. This finding is valuable to policymakers who intend to impose

regulatory quotas on female board membership. My evidence suggests that including more women as independent directors could curb the gender interaction's increasing impact on earnings manipulation.

The rest of this chapter is organised as follows. Section 3.2 introduces the institutional background. Section 3.3 discusses the conceptual background and develops the hypotheses. Section 3.4 describes the data and the research methodology. Section 3.5 presents the empirical results. Section 3.6 concludes this chapter.

3.2. Institutional background

In Chinese firms, the top executive officer in charge of business was entitled Chief Manager (CM) in the early 2000s. In more recent years, after China's accession to the World Trade Organisation, some firms have begun to entitle this person Chief Executive Officer (CEO) as it is in U.S. firms. CMs or CEOs are appointed by the board of directors as the head manager and they report directly to the board. They implement corporate policies set by the board, run day-to-day business, disclose corporate information to outside investors and government agencies and so forth. In addition, they can nominate qualified candidates to make up the management team. In some firms, the CMs or CEOs may sit on the board; in these cases, they have much higher status within the firm, which strengthens their managerial power in decision making.

CFOs in Chinese firms have similar responsibilities to those in U.S. firms. The *Company Law of China* prescribes that CFOs are responsible for the firms' financial planning, reporting and risk management. CFOs take part in corporate decision-making process along with CEOs. The accountability of CFOs has a direct impact on the quality of reported earnings. In light of the influential roles of CEOs and CFOs, I define both of them as *top managers*.

The board of directors in China has similar functions to that in the U.S. According to the *Code of Corporate Governance for Listed Companies in China*, published by China Securities Regulatory Commission in 2002, the board of directors is required to represent the best interests of shareholders to oversee daily business operations and policy making. Directors are elected

during shareholder meetings, and the decisions regarding their appointment and dismissal need to be approved by shareholders. Directors are expected to have adequate knowledge of corporation laws and regulations regarding business operations and management.

The board of directors can be divided into two groups. Executive directors who hold managerial positions in the firm take part in daily operations on behalf of shareholders. Independent directors who are selected from outside the firm are not allowed to have any affiliation with majority shareholders. They typically have professional expertise, such as being certified public accountants or lawyers, in order to fulfil their monitoring duties. The *Company Law of China* requires that the board of directors consists of five to nineteen members and that at least one-third of the directors should be independent directors.

There are two separate boards in China and some European countries. One is the board of directors, which is identical to that in the U.S., responsible for monitoring and disciplining the management. The other one is the supervisory board, which is elected by shareholders and employees to supervise both the board of directors and the top management team. The board of directors and the supervisory board are established in parallel to serve shareholders' best interests but are organised in different ways. The supervisory board cannot include any members of the board or the management; it must be a separate, independent agency inside the firm. In contrast, the board of directors is more directly and frequently involved in corporate governance and business operations. The board of directors is composed of both executive directors and independent directors with similar

duties to their U.S. counterparts. To make my findings comparable to those of other countries, I follow Giannetti *et al.* (2015) and focus my analysis on the board of directors rather than the supervisory board.

3.3. Literature and hypotheses development

The previous literature has shown that CEOs and CFOs have pervasive interactions with the board of directors. The board serves two primary functions in these interactions. First, the board acts as a monitoring mechanism to address the agency conflicts between managers and investors. Boyd (1994) and Chhaochharia and Grinstein (2009) find that effective board monitoring compromises CEOs' ability to pursue excess compensation. Hoitash *et al.* (2012) show that CFOs in firms with stronger board governance experience a larger compensation decline following disclosures of material weakness in the firms' internal control. Borokhovich *et al.* (1996) show that in firms with more independent boards, CEOs are more likely to be appointed from outside the firms, and that the stock market responds more favourably to the appointment of outside CEOs than that of inside CEOs. Shivdasani and Yermack (1999) find that firms tend to appoint fewer independent directors when CEOs are involved in director selection. The second function of the board is to provide professional expertise and advice to aid corporate decision-making. Westphal (1999) find that CEOs who have social ties (e.g., friendships) with board directors are more likely to seek expert advice from these directors, and that the directors are more willing to offer such advice.

In view of these dynamic relationships between CEO/CFO and the board of directors, I expect that gender similarity could be a factor that facilitates the interactions. The existing evidence indicates that women cooperate more with women than with men. Maccoby (1988) argues that girls and boys are

segregated when they are very young and continually exposed to different gender groups for much of their childhood. Girls' same-sex relationships are characterised by cooperation and interpersonal harmony, while boys' same-sex relationships exhibit an inclination to compete and dominate (Maccoby 1990). Such gender differences in attitudes and behaviours continue to manifest in adulthood. The experiment by Eckel and Grossman (2001) further shows that the agreement among women is more easily attainable and that women are more likely to accept the offer of other women. Chatman and O'Reilly (2004) find that women perform better in all-female work groups. Greig and Bohnet (2009) find that in Kenya, women contribute more to the provision of public goods in all-female groups than in mixed-sex groups, reflective of the greater cooperation among women in daily life.

Within firms, women tend to help each other. Matsa and Miller (2011) show that firms with higher female representation on the board tend to appoint more women to the top management team. Weber and Zulehner (2010) find that start-up firms with women among the first hires appoint more women in the future and have a higher likelihood of survival in the markets. Price (2012) and Tate and Yang (2015) both find that the presence of female leadership in top management reduces the wage disparity between women and men employees. Therefore, it is plausible to expect that, at the top of corporate hierarchy, female CEOs and CFOs tend to collaborate more with female directors than with male directors.

The collaboration between female CEOs/CFOs and female directors can bring about two opposite effects on firm performance. The total effect is thus

an empirical issue. On the one hand, the collaboration could dampen the monitoring ability of the board of directors. Serving as a monitoring facility that is essential to addressing agency problems, the board of directors should maintain a certain degree of independence from the management team in order to detect and discipline managerial misconduct (Hermalin & Weisbach 1998; Shivdasani & Yermack 1999). As the close interaction connects directors to managers to some extent (Coles *et al.* 2014; Lee *et al.* 2014; Khanna *et al.* 2015), it could undermine the effectiveness of board monitoring, which would result in inferior firm performance (Rosenstein & Wyatt 1990).

One the other hand, the collaboration between female CEOs/CFOs and female directors encourages directors' provision of professional expertise to managers. Due to a closer interaction, female CEOs/CFOs are likely to have more efficient information exchange with female directors. Female directors could offer extra expert advice and knowledge for female CEOs/CFOs in problem solving. The improved operational efficiency leads to higher firm profitability. In addition, with more women rising to the top of the firms, a female-friendly corporate culture would arise (Matsa & Miller 2011; Tate & Yang 2015) and produce an equal, vibrant environment for women to perform, thereby enhancing firm performance.

Therefore, I formulate the two competing hypotheses as follows:

H1a (Board Independence Hypothesis): The gender interaction between female top managers and female board directors impairs firm performance.

H1b (Operational Efficiency Hypothesis): The gender interaction between female top managers and female board directors improves firm performance.

3.4. Data and research design

3.4.1. Sample construction

My sample comprises all public firms listed on the Shanghai and Shenzhen Stock Exchanges of China. I collect board composition data, top management team information and firm-level accounting data from the China Stock Market and Accounting Research (CSMAR) database. In firms that have a CM but no CEO, I take the person entitled the CM to be the CEO. In firms that have both CM and CEO, I retain only the CEO. After excluding financial and utility firms, I am left with a sample of 19,022 firm-year observations from 2,328 firms for the period 2000–2014.

3.4.2. Empirical model

I examine the gender interaction's impact on firm performance by estimating the following regression model:

$$\begin{aligned}\text{Firm performance}_{i,t} &= \alpha_0 + \alpha_1\left(\text{Female top manager}_{i,t} \times \%\text{Female directors}_{i,t}\right) \\ &+ \alpha_2\text{Female top manager}_{i,t} + \alpha_3\%\text{Female directors}_{i,t} \\ &+ \sum \boldsymbol{CONTROLS}_{i,t-1} + \varepsilon_{i,t}\end{aligned} \quad \text{(Equation 3.1)}$$

where firm performance is measured by *ROA*. *Female top manager* is a dummy variable equal to 1 if either the CEO or the CFO is female, and 0 if both are male. *%Female directors* is the proportion of female directors on the board.

The interaction term, *Female top manager* × *%Female directors*, is the key variable of interest.

Consistent with the convention in the gender diversity literature (Adams & Ferreira 2009; Dezsö & Ross 2012; Liu *et al.* 2014), the regression model controls for a number of board and management characteristics that have been identified as explanatory factors for firm performance. As shown by Yermack (1996), firms with smaller boards tend to underperform. Core *et al.* (1999) and Rosenstein and Wyatt (1990) find that board independence influences corporate governance and, hence, firm performance. Haleblian and Finkelstein (1993) show that firms with larger management teams have better performance. Therefore, I control for the natural logarithm of the number of directors on the board (*Ln(Board size)*), the proportion of independent directors on the board *(%Independent directors*) and the natural logarithm of the number of executives in top management team (*Ln(Management size)*).[12]

A variety of firm characteristics are also included as control variables. Fama and French (1998) document an inverse relation between leverage and firm value. Brush *et al.* (2000) show that sales growth is positively related to firm performance. Yermack (1996) finds a positive association between firm size and firm performance. Peng (2004) shows that younger firms have better performance. I thus control for leverage ratio (*Leverage*), sales growth (*Ln(1+Sales growth)*), firm size (*Ln(Assets)*) and firm age (*Ln(Firm age)*).

[12] Following Dezsö and Ross (2012), I define the top management team as the senior executives reported in the top executive file of the CSMAR database.

Following Amore *et al.* (2014), the control variables are lagged by one year relative to the dependent variable in order to mitigate simultaneity issue.

Industry dummies and year dummies are incorporated to account for industry-wide and yearly economic fluctuations, respectively. I estimate Equation 3.1 using ordinary least squares (OLS) regressions with robust standard errors adjusted for firm-level clustering. Table 3.1 summarises the variable definitions.

3.4.3. Descriptive statistics

In Panel A of Table 3.2, I compare gender diversity in top corporate positions between Chinese firms and U.S. firms. The mean value of the variable *female top manager* in Chinese firms is 0.289, which is significantly higher than the corresponding ratio of 0.042 in U.S. firms. The proportion of Chinese firms having female CEOs (0.049) is more than twice that of U.S. firms (0.022). The fraction of female CFOs in Chinese firms (0.256) is nearly thrice that in U.S. firms (0.088). On average, 11% of board directors in Chinese firms are women, being of similar level to the female board representation of 10% in U.S. firms. In addition, in China the female directors are more likely to be executive directors, whereas in the U.S. women are more likely to be independent directors. In general, women tend to have more managerial power in Chinese firms. Panel B of Table 3.2 presents the summary statistics of ROA and control variables for all listed firms in China. The average ROA of Chinese firms is 4.8%. About 32% of board members are independent directors.

Table 3.1 Variable Definitions

Variable	Description
Firm performance:	
ROA	EBIT divided by total assets
Female top manager:	
Female top manager	1 if a firm has a female CEO or a female CFO, and 0 otherwise
Board gender diversity:	
%Female directors	the proportion of female directors on the board
%Female executive directors	the proportion of female executive directors on the board
%Female independent directors	the proportion of female independent directors on the board
Control variables:	
Ln(Board size)	the natural logarithm of the number of directors on the board
%Independent directors	the proportion of independent directors on the board
Ln(Management size)	the natural logarithm of the number of top executives reported in CSMAR
Leverage	total debt divided by total assets
Ln(1+Sales growth)	the natural logarithm of one plus annual growth in total sales
Ln(Assets)	the natural logarithm of total assets
Ln(Firm age)	the natural logarithm of the number of years of stock listing
Cash holding	total cash divided by total assets
R&D	research and development expenses divided by total assets
Capital expenditure	capital expenditures divided by total assets
Government ownership	the proportion of shares held by government
Institutional ownership	the proportion of shares held by bank trusts, insurance companies, investment companies, independent investment advisors, pension funds, and other institutions
Managerial ownership	the proportion of shares held by top executives
Regional development	the provincial marketisation index
Industry dummy	2-digit Global Industry Classification Standard (GICS) code

Table 3.2 Descriptive Statistics

This table presents descriptive statistics of gender diversity and control variables. Panel A compares the gender composition of top managers and the female board representation between Chinese firms and U.S. firms. For U.S. firms, the data on CEO and CFO gender comes from Execucomp; the data on board gender diversity comes from RiskMetrics. Panel B describes the distribution of control variables. Variable definitions are provided in Table 3.1.

Panel A: Female top managers and female board directors

	Mean	SD	Min	p25	Median	p75	Max
China							
Female top manager	0.289	0.453	0.000	0.000	0.000	1.000	1.000
Female CEO	0.049	0.216	0.000	0.000	0.000	0.000	1.000
Female CFO	0.256	0.437	0.000	0.000	0.000	1.000	1.000
%Female directors	0.110	0.110	0.000	0.000	0.111	0.167	0.833
%Female executive directors	0.064	0.084	0.000	0.000	0.000	0.111	0.636
%Female independent directors	0.047	0.068	0.000	0.000	0.000	0.100	0.571
US							
Female top manager	0.042	0.201	0.000	0.000	0.000	0.000	1.000
Female CEO	0.022	0.147	0.000	0.000	0.000	0.000	1.000
Female CFO	0.088	0.283	0.000	0.000	0.000	0.000	1.000
%Female directors	0.100	0.096	0.000	0.000	0.100	0.167	0.429
%Female executive directors	0.006	0.026	0.000	0.000	0.000	0.000	0.167
%Female independent directors	0.088	0.090	0.000	0.000	0.091	0.143	0.375

Panel B: Descriptive statistics of firm performance and controls (China)

	Mean	SD	Min	p25	Median	p75	Max
ROA	0.048	0.087	-0.562	0.026	0.050	0.080	0.355
Ln(Board size)	2.255	0.232	1.386	2.197	2.197	2.398	3.219
%Independent directors	0.320	0.133	0.000	0.316	0.333	0.375	1.000
Ln(Management size)	1.796	0.383	0.000	1.609	1.792	2.079	3.761
Leverage	0.490	0.314	0.040	0.315	0.472	0.618	3.208
Ln(1+Sales growth)	0.131	0.468	-9.212	-0.013	0.127	0.270	11.810
Ln(Assets)	21.430	1.207	10.840	20.660	21.290	22.060	28.480
Ln(Firm age)	1.830	0.766	-1.710	1.280	1.984	2.449	3.138

To decide upon the best methodology to carry out the hypothesis tests, I assess whether there is enough time-series variation in the variables of interest. In Table 3.3, I present the proportion of sample firms that experience a change in the variables of *Female top manager*, *Female CEO*, *Female CFO*, *%Female directors*, *%Female executive directors* and *%Female independent directors* over a one-year period, respectively. The results report rather limited within-firm variation in these variables. On average, the variable *Female top manager* varies in 6.30 % of sample firms on a yearly basis. Specifically, only 1.72% of firms experience a transition between female CEOs and male CEOs, while the ratio of a gender transition due to CFO replacements is 5.50%. Over the whole sample period, 6.25% of firm-years undergo a change in *Female top manager*. Regarding female board representation, the within-firm variation is also small. There is a change in *%Female directors* in 20.68% of firm-years.

Collectively, the analysis suggests that the use of firm-fixed effects or dynamic panel generalised method of moments (GMM) estimator is inappropriate. Both techniques remove unobservable between-firm heterogeneity and exploit only the within-firm variation for identification, and thus would largely undermine the statistical significance of the gender variables that have limited time-series variation. In the robustness section, I will address issues related to endogeneity.

Table 3.3 Change in Female Top Manager and Female Board Directors over Time

This table presents the fraction of sample firms that experience a change in the variables of *Female top manager*, *Female CEO*, *Female CFO*, *%Female directors*, *%Female executive directors*, and *%Female independent directors*, on a yearly basis from 2000 to 2014. The results are based on a sample of 19,022 firm-year observations from 2,328 listed firms in China.

	Change in						
year	Female top manager	Female CEO	Female CFO	%Female directors	%Female executive directors	%Female independent directors	#Firms (#Firm-years)
2000	-	-	-	-	-	-	671
2001	8.92%	2.36%	7.09%	20.21%	19.29%	3.28%	762
2002	8.17%	1.90%	7.05%	29.68%	18.70%	16.91%	893
2003	7.11%	2.12%	5.84%	24.63%	17.41%	13.27%	942
2004	6.89%	2.10%	6.29%	16.77%	13.27%	5.29%	1,002
2005	7.89%	1.50%	6.95%	17.48%	13.35%	6.11%	1,064
2006	7.25%	1.68%	6.54%	17.33%	12.20%	7.34%	1,131
2007	7.94%	2.29%	6.27%	20.39%	13.06%	11.39%	1,133
2008	5.81%	1.24%	4.81%	22.24%	10.79%	14.94%	1,205
2009	6.68%	1.31%	6.30%	20.89%	12.52%	12.90%	1,302
2010	5.65%	2.01%	4.61%	20.28%	12.26%	11.00%	1,346
2011	5.30%	1.61%	5.44%	18.59%	11.34%	10.47%	1,490
2012	5.17%	1.79%	4.40%	17.56%	9.30%	10.98%	1,839
2013	5.64%	1.45%	5.50%	21.61%	11.77%	13.51%	2,073
2014	6.09%	2.44%	5.35%	29.55%	14.66%	20.79%	2,169
Mean	6.30%	1.72%	5.50%	19.81%	12.66%	10.54%	1,268
2000-2014							
Percent of firms	33.25%	9.66%	30.54%	68.00%	48.93%	52.79%	2,328
Percent of firm-years	6.25%	1.77%	5.51%	20.68%	12.61%	11.65%	(19,022)

3.5. Results

3.5.1. Gender interaction within Chinese firms

Women helping women is a key assumption behind the rationale for proposing a significant impact of gender interaction on firm performance.[13] I thus need to confirm whether this is the case in Chinese firms. Following Matsa and Miller (2011), I explore whether the presence of female directors facilitates women's progression to CEO and CFO positions. Table 3.4 reports the Probit regression results. The dependent variable is *Female top manager*, and the key independent variable is lagged *%Female directors*. Model 1 shows that a firm with a more gender-diverse board in the previous year is more likely to have a female CEO or a female CFO in the current year. In model 2, I control for *%Female directors* of the current year, and find that the relation between female top managers and board gender diversity remains significantly positive. Jointly, the results suggest that women at the top corporate hierarchy tend to help each other.

3.5.2. Gender interaction and firm profitability

In Table 3.5, I present the OLS regression results for the impact of gender interaction on ROA. In model 1, I observe that the coefficient of *Female top manager* is positive and significant, which suggests that the presence of

[13] Matsa and Miller (2011) find that firms with more women as board directors tend to add more women to their top management team. They further argue that this finding 'presents evidence of women helping women in corporate America' (p.635). Admittedly, observing female appointments by females does not necessarily indicate the presence of female 'cooperation', because whether women directors would 'cooperate' with the newly appointed women managers in daily business operations is another case.

Table 3.4 Gender Interaction within Chinese Firms

This table presents regression results to test the interaction effect among women in Chinese firms. The dependent variable is *Female top manager*, which is equal to 1 if a firm has a female CEO or CFO, and 0 otherwise. All control variables are lagged by one year relative to the dependent variable. The regressions are estimated using a Probit model. Cluster-robust *z*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

Dependent variable =	Female top manager	
	[1]	[2]
%Female directors:		
Previous year	2.369***	0.871***
	[12.24]	[4.74]
Current year		1.739***
		[8.64]
Control variables:		
Ln(Board size)	-0.127	-0.121
	[-1.42]	[-1.35]
%Independent directors	-0.002	0.026
	[-0.01]	[0.10]
Ln(Management size)	0.075	0.079
	[1.27]	[1.33]
Leverage	-0.008	-0.01
	[-0.12]	[-0.15]
Ln(1+Sales growth)	0.050**	0.051**
	[2.24]	[2.34]
Ln(Assets)	-0.069***	-0.067***
	[-3.15]	[-3.04]
Ln(Firm age)	-0.048	-0.047
	[-1.34]	[-1.33]
Constant	0.736	0.660
	[1.52]	[1.36]
Year fixed effect	Y	Y
Firm fixed effect	Y	Y
R^2	0.0517	0.0561
N	16,666	16,666

Table 3.5 Gender Interaction and Firm Profitability

This table presents OLS regressions of ROA on the interaction between female top managers and female directors. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

DV=ROA	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Female top manager	0.003*		0.004*	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
	[1.73]		[1.81]	[-0.26]	[-0.33]	[-0.51]	[-0.20]	[-0.48]	[-0.09]
%Female directors		-0.001	-0.004	-0.017	-0.014	-0.019*	-0.015	-0.014	-0.014
		[-0.14]	[-0.51]	[-1.58]	[-1.37]	[-1.69]	[-1.39]	[-1.24]	[-1.21]
Female top manager × %Female directors				0.033**	0.030*	0.038**	0.035**	0.037**	0.032*
				[1.99]	[1.86]	[2.20]	[2.04]	[2.13]	[1.83]
Control variables:									
Ln(Board size)	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002	-0.001
	[-0.54]	[-0.58]	[-0.54]	[-0.54]	[-0.43]	[-0.65]	[-0.62]	[-0.55]	[-0.32]
%Independent directors	-0.000	-0.000	-0.000	-0.001	0.003	0.003	-0.005	0.002	0.000
	[-0.02]	[-0.02]	[-0.03]	[-0.05]	[0.24]	[0.29]	[-0.42]	[0.18]	[0.04]
Ln(Management size)	-0.004	-0.004	-0.004	-0.004	-0.005**	-0.005*	-0.003	-0.005*	-0.004
	[-1.59]	[-1.58]	[-1.61]	[-1.62]	[-1.97]	[-1.90]	[-1.28]	[-1.73]	[-1.63]
Leverage	-0.016***	-0.016***	-0.016***	-0.016***	-0.006	-0.015***	-0.017***	-0.004	-0.004
	[-3.16]	[-3.16]	[-3.16]	[-3.15]	[-1.10]	[-2.73]	[-3.03]	[-0.70]	[-0.65]
Ln(1+Sales growth)	0.027***	0.027***	0.027***	0.027***	0.025***	0.025***	0.028***	0.024***	0.024***
	[9.11]	[9.13]	[9.10]	[9.11]	[8.73]	[8.18]	[9.04]	[7.85]	[7.78]
Ln(Assets)	0.007***	0.007***	0.007***	0.007***	0.006***	0.007***	0.006***	0.006***	0.006***
	[6.69]	[6.59]	[6.64]	[6.57]	[6.30]	[6.47]	[5.78]	[5.20]	[5.65]
Ln(Firm age)	-0.009***	-0.009***	-0.009***	-0.009***	-0.002	-0.008***	-0.008***	-0.001	-0.001
	[-7.45]	[-7.52]	[-7.47]	[-7.47]	[-1.62]	[-6.63]	[-6.70]	[-0.44]	[-0.75]
Additional controls:									
Cash holding					0.090***			0.094***	0.091***
					[9.93]			[9.51]	[9.25]
R&D					-0.087			-0.027	-0.099
					[-0.80]			[-0.24]	[-0.89]
Capital expenditure					0.110***			0.113***	0.110***
					[8.40]			[8.34]	[8.26]
Government ownership						0.007		0.010**	0.008*

						[1.48]		[2.24]	[1.74]
Institutional ownership						0.026***		0.026***	0.025***
						[5.19]		[5.15]	[4.98]
Managerial ownership						0.039***		0.031***	0.031***
						[3.62]		[2.66]	[2.59]
Regional development							0.004***	0.003***	0.003***
							[6.09]	[5.72]	[5.74]
Constant	-0.043**	-0.040*	-0.042*	-0.040*	-0.061***	-0.068***	-0.050**	-0.106***	-0.119***
	[-2.02]	[-1.85]	[-1.95]	[-1.84]	[-2.85]	[-3.00]	[-2.21]	[-4.49]	[-4.69]
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry-year fixed effect	N	N	N	N	N	N	N	N	Y
R^2	0.073	0.072	0.073	0.073	0.092	0.074	0.08	0.101	0.117
N	19,022	19,022	19,022	19,022	19,022	17,585	17,910	16,563	16,563

female top managers in the top management improves firms' accounting profitability. In model 2, the coefficient of *%Female directors* is statistically insignificant. In model 3, where I include both *Female top manager* and *%Female directors*, the effect of *Female top manager* remains positive and significant. The effect is also economically relevant. The ROA of women-led firms is 0.004 higher than that of men-led firms, holding other controls constant. Given that the mean ROA is 0.048, an increase of 0.004 in ROA corresponds to a percentage increase of 8.3% (=0.004/0.048).

For the control variables, *Leverage* is negatively related to ROA, consistent with the notion that high leverage may reflect potential problems in firms' profitability (Fama & French 1998). *ln(1+Sales growth)* has a significantly positive association with ROA, consistent with the argument of Brush *et al.* (2000) that growth in sales enables firms to fully employ production capacity, which in turn enhances firm profits. *ln(Assets)* is positively associated with ROA, suggesting that larger firms perform better (Yermack 1996). I find a negative relation between *ln(Firm age)* and ROA, consistent with the finding of Peng (2004) that younger Chinese firms have more effective governance systems and consequently have better accounting performance.

In model 4, I test the hypothesis H1 by multiplying *Female top manager* by *%Female directors*.[14] The insignificant coefficient on *Female top manager* suggests that when none of the directors are women, the presence of female

14 To rule out the possibility that multicollinearity would confound my results, I compute the variance inflation factors (VIF) for each explanatory variable and find all the VIFs below 10.

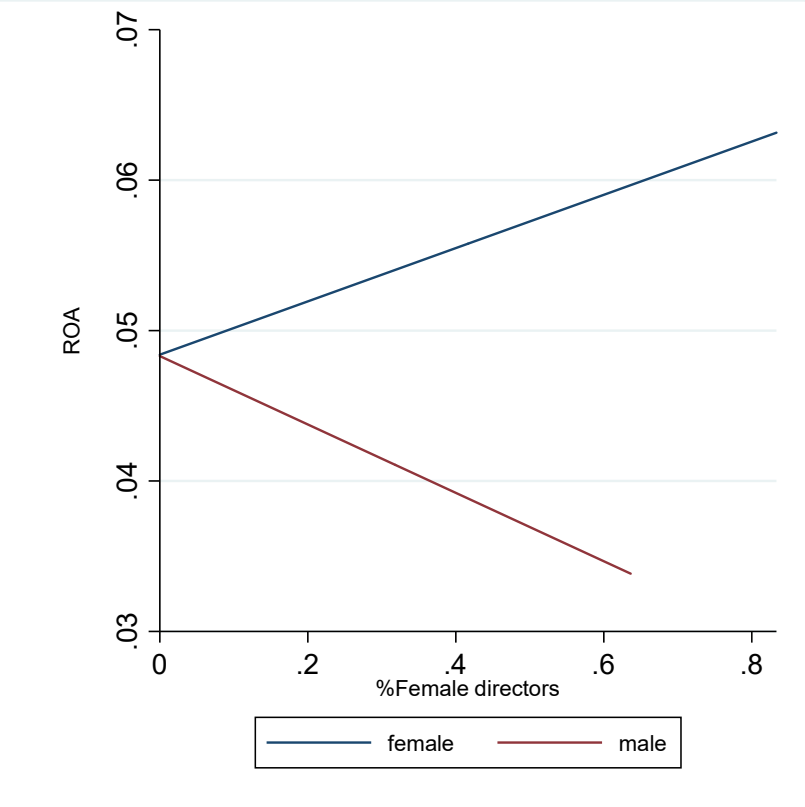
top managers in the top management has no significant impact on ROA. The coefficient on *Female top manager* × *%Female directors* is positive and significant at the 5% level, which suggests that higher board gender diversity increases the positive effect of female top managers on ROA.

Figure 3.1 plots the marginal effect of the presence of female top managers in firms with different proportions of women on the board. When there are no women on board (*%Female directors*=0), the fitted ROA is roughly equal to 0.048, no matter whether there is female leadership or male leadership in the top management team. The marginal effect, which is the ROA difference between firms with female and with male leadership monotonically increases as *%Female directors* increases. Specifically, at the 50th percentile of *%Female directors* (=0.111), the ROA difference is 0.003, which is statistically insignificant. At the 75th percentile of *%Female directors* (=0.167), the ROA difference is 0.005, which is statistically significant at the 5% level. In fact, when 14% of board directors are female – approximately one female director – the marginal effect of female top managers turns to be statistically significant.

To further reduce omitted variable bias, I include additional firm- and market-level control variables. In model 5 of Table 3.2, I control for corporate financial policies. *Cash holding* is positively and significantly related to ROA, as firms with large cash reserves can benefit from less costly internal financing (Mikkelson & Partch 2003). *Capital expenditure* has a positive and significant

Figure 3.1 Marginal Effect of Presence of Female Top Managers

This graph plots the marginal effect of female top managers on ROA in firms with different proportions of female directors on board. The blue line is the linear prediction plot for firms with female top managers, and the red line is the linear prediction plot for firms with male top managers. These two lines plot how ROA varies with *%Female directors* for these series.



association with ROA, consistent with the finding of McConnell and Muscarella (1985) that firms tend to make capital investments that improve firm profitability. In model 6, I control for ownership structure. I find that *Institutional ownership* significantly increases ROA, which supports the idea that institutional investors monitor and discipline managerial behaviours to improve firms' accounting performance (McConnell & Servaes 1990). I document a significant impact of *Managerial ownership* on ROA, consistent with the finding of Coles *et al.* (2012). In addition, local market development conditions may also affect firm performance. There is a considerable difference in the level of economic development across China's provinces. In model 7, I control for *Regional development*, which is a comprehensive index of regional market development level of each province, collected from the NERI INDEX of Marketisation of China's Provinces Report (2011). The index is assigned to each firm based on the location of the firm's headquarters. Firms headquartered in more developed provinces show better performance. Model 8 includes all additional control variables, and model 9 further includes industry-year fixed effects to capture all time-varying industry characteristics. Altogether, the results show that the interaction between female top managers and female board directors significantly increases ROA.

3.5.3. Female gender interaction versus male gender interaction

Is the gender interaction effect specific to women? To clarify this question, I test whether male top managers interact with male directors. *Male top manager* is equal to 1 if both CEO and CFO in the firm are men, and 0 otherwise. Since male leadership is collinear with female leadership, if both

are included in a single model, one will be dropped. I thus use only *Female top manager* as the proxy for gender composition in top management. To make sure that female interaction and male interaction can be simultaneously examined in one model, I do not use *%Female directors* or *%Male directors* as the multiplier, because *Female top manager* × *%Female directors* and *Male top manager* × *%Male directors* will be perfectly collinear. I construct new variables to represent board gender diversity. *High female representation on board* is equal to 1 if the percentage of female directors on a firm's board is no less than the 75th percentile of the sample, and 0 otherwise. *High male representation on board* is constructed analogously for male directors.

In mode 1 of Table 3.6, female interaction is positively and significantly related to ROA. In model 2, male interaction has no significant impact on ROA. When both female interaction and male interaction are included in model 3, only the female interaction effect is statistically significant. Thus, I argue that the gender interaction effect only takes place among women. I find little evidence that there exists a significant interaction effect between male top managers and male board directors.

3.5.4. Gender interaction, firm profitability and managerial power of women

Executive directors have the managerial power to support the execution of corporate decisions made by female top managers. In contrast, independent directors do not hold any executive positions in firms. They sit on board by

Table 3.6 Female Gender Interaction versus Male Gender Interaction

This table presents OLS regressions of ROA on the gender interaction between female top managers and female board directors while controlling for male gender interaction. *Female top manager* is equal to 1 if a firm has a female CEO or CFO, and 0 otherwise. *Male top manager* is equal to 1 if both CEO and CFO in the firm are male, and 0 otherwise. *High female representation on board* is equal to 1 if the percentage of female directors on the board is no less than the 75th percentile of the sample, and 0 otherwise. *High male representation on board* is equal to 1 if the percentage of male directors on the board is no less than the 75th percentile of the sample, and 0 otherwise. Control variables are included but suppressed for brevity. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

DV=ROA	[1]	[2]	[3]
Female top manager	-0.000	0.004	-0.002
	[-0.06]	[1.64]	[-0.66]
High female representation on board	-0.005**		-0.007***
	[-2.07]		[-2.64]
Female top manager × High female representation on board	0.011***		0.013***
	[2.74]		[2.94]
High male representation on board		-0.003	0.000
		[-0.87]	[0.01]
Male top manager × High male representation on board		0.002	-0.004
		[0.50]	[-0.80]
Controls	Y	Y	Y
Industry fixed effect	Y	Y	Y
Year fixed effect	Y	Y	Y
R^2	0.101	0.1	0.101
N	16,563	16,563	16,563

providing external monitoring and professional expertise. Independent directors add less than executive directors to the managerial power of female top managers. I expect that the effect of female top managers on firm performancerequires female executive directors' managerial power to enhance women's status in the top management. To test this prediction, in Table 3.7, I examine the gender interactions of *Female top manager* with *%Female executive directors* and *%Female independent directors*.

In model 1, neither *%Female executive directors* nor *%Female independent directors* reports statistically significant impact on ROA. In model 2, the coefficient on *Female top manager* is positive and significant at the 5% level. In model 3, the coefficient of *Female top manager* × *%Female executive directors* is significantly positive, indicating that the more women are added as executive directors to a firm led by a female CEO/CFO, the higher the profitability (as measured by ROA) of that firm. The coefficient of *%Female executive directors* is significantly negative, which means that in absence of female top managers (i.e., both CEO and CFO are men) a higher proportion of female executive directors on board will reduce ROA.

Figure 3.2 plots the marginal effect of the presence of female top managers in firms with different proportions of female executive directors on board. When none of the executive directors are female (*%Female executive directors*=0), the marginal effect, which is the ROA difference between firms with female and with male leadership in top management team is negligible. The marginal effect monotonically increases as *%Female executive directors*

Table 3.7 Gender Interaction, Firm Profitability and Managerial Power of Women

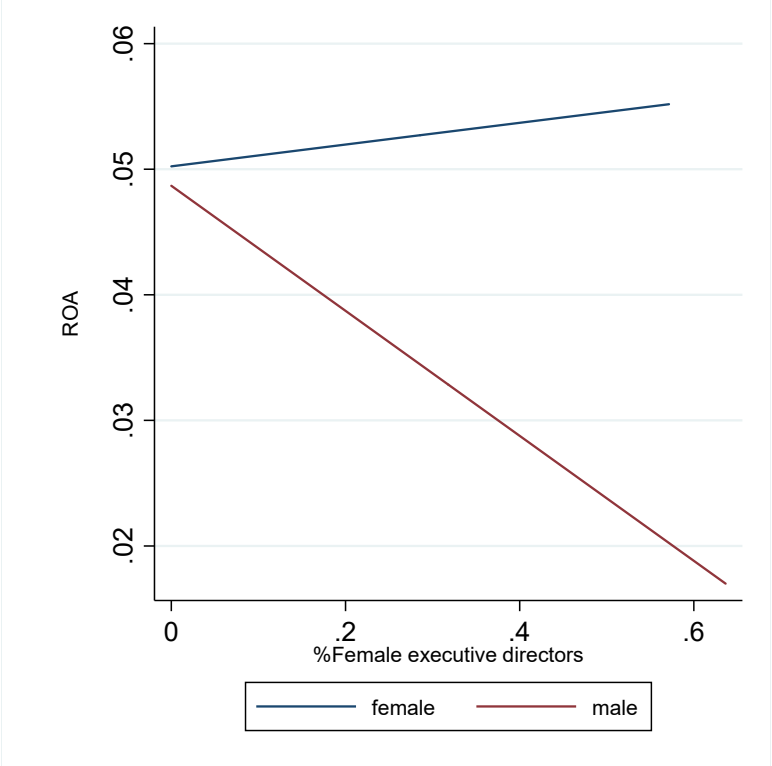
This table presents OLS regressions of ROA on the interaction between female top managers and female executive/independent directors. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

DV=ROA	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Female top managers		0.004**	-0.001	-0.001	-0.001	-0.000	-0.001	-0.000
		[2.01]	[-0.18]	[-0.25]	[-0.45]	[-0.11]	[-0.40]	[-0.02]
%Female executive directors	-0.011	-0.016	-0.035***	-0.032**	-0.042***	-0.038***	-0.041***	-0.039***
	[-1.15]	[-1.63]	[-2.62]	[-2.44]	[-2.81]	[-2.82]	[-2.80]	[-2.64]
%Female independent directors	0.014	0.013	0.007	0.009	0.006	0.015	0.017	0.015
	[1.15]	[1.07]	[0.42]	[0.57]	[0.38]	[0.93]	[1.06]	[0.94]
Female top managers × %Female executive directors			0.045**	0.039**	0.055**	0.051**	0.054**	0.049**
			[2.23]	[2.00]	[2.51]	[2.44]	[2.43]	[2.22]
Female top managers × %Female independent directors			0.018	0.02	0.02	0.016	0.022	0.015
			[0.74]	[0.84]	[0.79]	[0.64]	[0.89]	[0.63]
Control variables:								
Ln(Board size)	-0.002	-0.002	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001
	[-0.50]	[-0.45]	[-0.44]	[-0.32]	[-0.53]	[-0.49]	[-0.40]	[-0.18]
%Independent directors	-0.002	-0.002	-0.002	0.001	0.002	-0.007	-0.000	-0.002
	[-0.14]	[-0.17]	[-0.19]	[0.08]	[0.14]	[-0.60]	[-0.03]	[-0.15]
Ln(Management size)	-0.004	-0.004	-0.004	-0.005**	-0.005*	-0.003	-0.005*	-0.004
	[-1.59]	[-1.62]	[-1.64]	[-2.00]	[-1.94]	[-1.29]	[-1.75]	[-1.64]
Leverage	-0.016***	-0.016***	-0.016***	-0.006	-0.015***	-0.017***	-0.004	-0.004
	[-3.16]	[-3.16]	[-3.15]	[-1.09]	[-2.73]	[-3.02]	[-0.68]	[-0.63]
Ln(1+Sales growth)	0.027***	0.027***	0.027***	0.025***	0.025***	0.028***	0.024***	0.024***
	[9.15]	[9.12]	[9.13]	[8.75]	[8.20]	[9.07]	[7.89]	[7.82]
Ln(Assets)	0.007***	0.007***	0.007***	0.006***	0.007***	0.006***	0.006***	0.006***
	[6.59]	[6.65]	[6.57]	[6.32]	[6.48]	[5.77]	[5.19]	[5.64]
Ln(Firm age)	-0.009***	-0.009***	-0.009***	-0.002*	-0.008***	-0.009***	-0.001	-0.001
	[-7.55]	[-7.51]	[-7.50]	[-1.67]	[-6.68]	[-6.75]	[-0.52]	[-0.81]
Additional controls:								
Cash holding				0.090***			0.094***	0.092***
				[9.96]			[9.54]	[9.28]
R&D				-0.085			-0.030	-0.100

				[-0.79]			[-0.26]	[-0.89]
Capital expenditure				0.109***			0.111***	0.109***
				[8.30]			[8.23]	[8.16]
Government ownership					0.007		0.010**	0.008*
					[1.45]		[2.24]	[1.75]
Institutional ownership					0.027***		0.026***	0.025***
					[5.21]		[5.19]	[5.01]
Managerial ownership					0.039***		0.031***	0.031***
					[3.61]		[2.66]	[2.59]
Regional development						0.004***	0.004***	0.004***
						[6.24]	[5.88]	[5.89]
Constant	-0.039*	-0.042*	-0.040*	-0.061***	-0.068***	-0.050**	-0.107***	-0.120***
	[-1.83]	[-1.95]	[-1.83]	[-2.85]	[-3.02]	[-2.20]	[-4.53]	[-4.73]
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Industry-year fixed effect	N	N	N	N	N	N	N	Y
R^2	0.073	0.073	0.074	0.092	0.075	0.08	0.102	0.118
N	19,022	19,022	19,022	19,022	17,585	17,910	16,563	16,563

Figure 3.2 Marginal Effect of Presence of Female Top Managers

This graph plots the marginal effect of female top managers on ROA in firms with different proportions of female executive directors on board. The blue line is the linear prediction plot for firms with female top managers, and the red line is the linear prediction plot for firms with male top managers. These two lines plot how ROA varies with *%Female executive directors* for these series.



increases. Specifically, at the 75th percentile of *%Female executive directors* (=0.111), the ROA difference is 0.005, which is statistically significant at the 5% level. In fact, when *%Female executive directors* exceeds 8% – approximately one female executive director on the board – the ROA difference between these two groups of firms turns to be statistically significant.

In models 4–8 of Table 3.7, I control for additional firm characteristics, market development levels and industry-year fixed effects. The findings continue to hold. In addition, some female CEOs and CFOs may be board members and thus count as female executive directors. I remove these observations from the count of female executive directors and re-calculate the variable *%Female executive directors*. The untabulated results show that my prior findings still hold. Taken together, the empirical results reveal that the increasing impact of female top managers on ROA is associated with the managerial power provided by female executive directors.

3.5.5. Endogeneity

Board characteristics could be endogenously chosen by firms to suit their operating or contracting environments (Adams & Ferreira 2009). Farrell and Hersch (2005) show that the likelihood of a firm adding a woman to its board is associated with the number of women already on the board and the firm's accounting performance. Thus, it is challenging to establish a causal relation between gender diversity and firm performance.

In Table 3.8, I test whether firm performance affects the appointment of women to the top corporate positions. The dependent variable in models 1 and

Table 3.8 Determinants of Gender in Appointments

This table presents regression results for the determinants of gender in appointments of top managers and directors. The dependent variable *Female CEO (CFO)* is a dummy variable equal to 1 if a female CEO (CFO) is appointed in a given year, and 0 otherwise. *#Female directors* (*#Female executive/independent directors*) is the total number of female directors (female executive/independent directors) appointed to the board in a given year. All independent variables are lagged by one year, except the departure variables. *Female CEO departure* (*Female CFO departure*) is equal to 1 if a female CEO (CFO) is replaced, and 0 otherwise. *#Female director departures* (*#Male director departures*) is the number of female (male) directors departing the board. Other departure variables are constructed analogously. Models 1 and 2 are estimated using a Probit model. Models 3–5 are estimated using a Poisson model. Cluster-robust *z*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

Dependent variable=	Female CEO	Female CFO	# Female directors	# Female executive directors	# Female independent directors
	[1]	[2]	[3]	[4]	[5]
ROA (lag)	-0.789***	-0.339	-0.898***	-1.274***	-0.556*
	[-2.66]	[-1.59]	[-4.21]	[-4.64]	[-1.93]
Ln(Board size) (lag)	-0.218	0.168**	-0.897***	-0.720***	-0.869***
	[-1.45]	[2.12]	[-10.01]	[-5.45]	[-8.08]
%Female directors (lag)	1.031***	0.266	0.475***	0.363	0.503**
	[4.12]	[1.62]	[2.64]	[1.42]	[2.15]
Ln(Management size) (lag)	0.051	0.06	-0.08	-0.073	-0.064
	[0.52]	[1.06]	[-1.38]	[-0.85]	[-0.92]
%Female executives (lag)	0.663***	0.631***	0.778***	1.519***	0.019
	[3.69]	[5.49]	[6.77]	[9.65]	[0.12]
Ln(1+Compensation) (lag)	0.021	-0.066***	0.023	0.052	-0.02
	[0.42]	[-3.39]	[0.90]	[1.23]	[-0.67]
Institutional ownership (lag)	-0.088	-0.065	0.032	0.121	-0.032
	[-0.54]	[-0.64]	[0.34]	[0.87]	[-0.27]
Stock return volatility (lag)	1.16	0.692*	-0.155	0.023	-0.236
	[1.60]	[1.68]	[-0.35]	[0.04]	[-0.43]
Ln(Assets) (lag)	-0.121***	-0.049***	-0.064***	-0.112***	-0.037*
	[-3.37]	[-2.79]	[-3.29]	[-3.78]	[-1.65]
Female CEO departure	0.902***				
	[6.62]				
Female CFO departure		1.310***			
		[20.70]			
# Female director departures			0.256***		
			[6.88]		

# Male director departures			0.201***		
			[19.33]		
# Female executive director departures				0.469***	
				[8.22]	
# Male executive director departures				0.300***	
				[17.86]	
# Female independent director departures					0.380***
					[4.74]
# Male independent director departures					0.378***
					[13.72]
Constant	-0.475	-0.51	1.345***	-0.211	1.547***
	[-0.52]	[-1.25]	[2.92]	[-0.31]	[2.79]
Industry fixed effect	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y
N	17,291	17,336	17,336	17,336	17,336

2 is a binary variable equal to 1 if a female CEO (CFO) is appointed in a given firm-year, and 0 otherwise. In models 3–5, the number of female (executive/independent) directors newly added to the board is used as the dependent variable.

Following Farrell and Hersch (2005), I control for board size (*Ln(Board size)*), board gender diversity (*%Female directors*), management size (*Ln(Management size)*), female representation in the top management team (*%Female executives*), total compensation paid to senior executives and board directors (*Ln(1+Compensation)*), institutional ownership (*Institutional ownership*), standard deviation of monthly stock returns (*Stock return volatility*) and firm size (*Ln(Assets)*). These control variables are lagged by one year relative to the dependent variable. Models 1–2 additionally control for a dummy indicator of whether a female top manager steps down in the current year. Models 3–5 control for the number of female directors departing the board in the current year.

In Table 3.8, I show that a firm with higher ROA is less likely to appoint a female CEO or a female director. This finding suggests a reverse causality issue in my study. In addition, women departures are positively significantly related to women appointments, in line with the argument that firms are likely to appoint a woman in order to achieve the preferred gender diversity goal when a female top manager or a female board director departs.

In light of these results, not having used fixed effects in my previous specifications (due to lack of time variation in the variables of interest) seems

less costly as strict exogeneity does not hold in my data. I therefore adopt an instrumental variables approach. There are three gender-related endogenous variables in my regression model: *Female top manager*, *%Female directors* and *Female top manager ×%Female directors*. Thus, at the minimum, I need three instrumental variables, of which the multiplication of two instruments can constitute the third instrument (Wooldridge 2010).

The gender diversity of the top management team and the board of directors could mimic that of their industry peers. Knyazeva *et al.* (2013) point out that firms' decisions on appointments of senior executives and board directors are affected by the local supply of qualified candidates. Women in the firms' nearby industry peers could be suitable candidates for firms to choose their top managers or directors. I thus define three instrumental variables as (1) *%Local female directors* – the industry average proportion of female directors in the province where the firm is headquartered, (2) *%Local female executives* – the industry average proportion of female executives in the province where the firm is headquartered, and (3) the multiplication of *%Local female directors* and *%Local female executives*.

In Panel A of Table 3.9, I report results for the two-stage-least-squares (2SLS) regressions of ROA on female interaction and control variables.[15] The first-stage regression results show that *Female top manager* is significantly

[15] I do not use 2SLS regressions to examine the interaction effect of female leaders and female executive/independent directors, because at least two additional endogenous variables need to be instrumented and I do not have more instruments to carry out the 2SLS regressions.

Table 3.9 Instrumental Variable Approach

This table presents 2SLS regressions of ROA on the interaction between female top managers and female board directors. The IVs include (1) *%Local female directors*, which is the industry average proportion of female directors in the province where the firm is headquartered; (2) *%Local female executives*, which is the industry average proportion of female executives in the province where the firm is headquartered; (3) *%Local female directors × %Local female executives*; and (4) P*roportion of male directors with board connections to female directors*, which is the number of male directors who sit on other boards where there are female directors, divided by the total number of male directors. Panel A uses (1)–(3) as IVs, and Panel B uses (1)–(4) as IVs. *Director connectedness*, which is defined as the total number of external board seats held by all directors in the firm, is controlled for in Panel B. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

Panel A: Exactly-identified model

1st stage	Female top manager	%Female directors	***2nd stage***	ROA
%Local female directors	0.350*	0.989***	Female top manager	-0.053***
	[1.70]	[17.30]		[-3.20]
%Local female executives	1.694***	-0.016	%Female directors	-0.100**
	[10.01]	[-0.41]		[-2.40]
%Local female directors × %Local female executives	-0.699	0.030	Female top manager × %Female directors	0.265***
	[-0.77]	[0.09]		[3.34]
Ln(Board size)	-0.036	-0.006	Ln(Board size)	-0.003
	[-1.22]	[-1.00]		[-0.70]
%Independent directors	0.004	-0.001	%Independent directors	0.002
	[0.05]	[-0.06]		[0.16]
Ln(Management size)	0.026	-0.006	Ln(Management size)	-0.004
	[1.29]	[-1.59]		[-1.51]
Leverage	-0.009	-0.002	Leverage	-0.013**
	[-0.35]	[-0.29]		[-2.28]
Ln(1+Sales growth)	0.001	-0.004**	Ln(1+Sales growth)	0.028***
	[0.13]	[-2.05]		[9.01]
Ln(Assets)	-0.020***	-0.007***	Ln(Assets)	0.005***
	[-2.81]	[-4.68]		[4.13]
Ln(Firm age)	-0.024**	-0.004*	Ln(Firm age)	-0.000
	[-2.27]	[-1.83]		[-0.30]
Cash holding	0.045	-0.002	Cash holding	0.091***
	[0.79]	[-0.13]		[9.04]
R&D	-0.985	-0.380*	R&D	-0.031
	[-0.86]	[-1.69]		[-0.25]
Capital expenditure	0.074	0.008	Capital expenditure	0.118***
	[0.87]	[0.42]		[8.58]
Government ownership	-0.083***	-0.030***	Government ownership	0.008*
	[-2.72]	[-4.60]		[1.89]
Institutional ownership	-0.011	-0.001	Institutional ownership	0.027***
	[-0.32]	[-0.19]		[5.35]
Managerial ownership	-0.02	0.038	Managerial ownership	0.027**
	[-0.21]	[1.39]		[2.12]
Regional development	-0.002	-0.000	Regional development	0.003***
	[-0.34]	[-0.28]		[5.49]
Constant	0.702***	0.211***	Constant	-0.058**
	[4.22]	[6.12]		[-2.01]
Industry fixed effect	Y	Y	Industry fixed effect	Y
Year fixed effect	Y	Y	Year fixed effect	Y
N	16,480	16,480	N	16,480
F test of excluded instruments	83.22	249.45		
Cragg-Donald Wald F-statistic	169.17			

(Table 3.9 continued)

Panel B: Over-identified model				
1st stage	Female top manager	%Female directors	***2nd stage***	ROA
%Local female directors	0.347*	0.987***	Female top manager	-0.053***
	[1.68]	[17.36]		[-3.22]
%Local female executives	1.696***	-0.014	%Female directors	-0.103**
	[10.00]	[-0.35]		[-2.50]
%Local female directors × %Local female executives	-0.714	0.023	Female top manager × %Female directors	0.275***
	[-0.79]	[0.07]		[3.49]
Proportion of male directors with external board connections to female directors	0.157**	0.023		
	[2.33]	[1.26]		
Director connectedness	-0.011***	-0.004***	Director connectedness	0.002***
	[-2.66]	[-4.48]		[4.11]
Ln(Board size)	-0.024	-0.002	Ln(Board size)	-0.005
	[-0.82]	[-0.30]		[-1.13]
%Independent directors	-0.002	-0.002	%Independent directors	0.002
	[-0.02]	[-0.13]		[0.18]
Ln(Management size)	0.026	-0.006	Ln(Management size)	-0.004
	[1.28]	[-1.59]		[-1.53]
Leverage	-0.009	-0.002	Leverage	-0.013**
	[-0.35]	[-0.32]		[-2.26]
Ln(1+Sales growth)	0.001	-0.004**	Ln(1+Sales growth)	0.027***
	[0.15]	[-2.02]		[9.03]
Ln(Assets)	-0.019***	-0.006***	Ln(Assets)	0.005***
	[-2.58]	[-4.09]		[3.75]
Ln(Firm age)	-0.023**	-0.003	Ln(Firm age)	-0.001
	[-2.22]	[-1.56]		[-0.52]
Cash holding	0.046	0.000	Cash holding	0.090***
	[0.81]	[-0.02]		[8.96]
R&D	-0.936	-0.352	R&D	-0.042
	[-0.82]	[-1.57]		[-0.34]
Capital expenditure	0.077	0.01	Capital expenditure	0.117***
	[0.91]	[0.50]		[8.53]
Government ownership	-0.082***	-0.029***	Government ownership	0.008*
	[-2.70]	[-4.53]		[1.86]
Institutional ownership	-0.011	0.000	Institutional ownership	0.026***
	[-0.30]	[0.03]		[5.14]
Managerial ownership	-0.025	0.037	Managerial ownership	0.026**
	[-0.25]	[1.37]		[2.07]
Regional development	-0.002	0.000	Regional development	0.003***
	[-0.29]	[0.00]		[5.20]
Constant	0.651***	0.185***	Constant	-0.047
	[3.88]	[5.31]		[-1.60]
Industry fixed effect	Y	Y	Industry fixed effect	Y
Year fixed effect	Y	Y	Year fixed effect	Y
N	16,480	16,480	N	16,480
F test of excluded instruments	64.61	187.93	Hansen J statistic	1.75
Cragg-Donald Wald F-statistic	127.33		(p-value)	(0.19)

positively related to *%Local female directors* and *%Local female executives* and that %*Female directors* is significantly positively related to *%Local female directors*, both consistent with my expectation. In the second-stage regression, the interaction term significantly increases ROA. The *F*-statistics of excluded instruments suggest that the instruments are not weak. I then use the Cragg-Donald statistic to examine the identification of the equation as a whole. The Cragg-Donald statistic is 169.17, higher than all the critical values reported in Table 5.1 of Stock and Yogo (2005).[16] This means that the bias of the 2SLS regression relative to the OLS regression does not exceed 5% at the 5% significance level. Thus, the weak instrument problem is not a major concern in my specification.

One drawback of having an exactly identified model (three endogenous variables and three instruments) is that the exogeneity assumption cannot be formally examined using the Sargan over-identification test. Following Adams and Ferreira (2009), I include an additional instrument defined as the fraction of male directors with external board connections to female directors of other firms. The logic is that a firm in which male directors sit on other boards where there are female directors is likely to add women to its board – thus, the relevance condition is fulfilled. Further, I ensure to control for *Director connectedness*, which is equal to the total number of external board seats held by all directors in the firm, as a proxy for the overall connectedness of the board. It is important to note that although the first three instruments are likely

[16] The highest critical value reported in Table 5.1 of Stock and Yogo (2005) is 21.42.

to be correlated, the fourth instrument is not. This is important as tests of overidentifying restrictions are particularly suspicious when all the instruments share a common vulnerability to being invalid (Murray 2006).

The over-identified 2SLS regression results are presented in Panel B of Table 3.9. The results show that *Female top manager* is significantly positively related to the connection instrument. The *F*-statistics and the Cragg-Donald statistic confirm that the model is not weakly identified. The Hansen *J* statistic for the over-identification test fails to reject the null hypothesis that the excluded instruments are uncorrelated with the residuals in the model.[17] In the second-stage 2SLS regression, the coefficient of the interaction term is 0.275, being of higher magnitude than the coefficient of 0.032 in the OLS regression reported in model 9 of Table 3.5. This implies that the gender interaction's impact on ROA is understated in the OLS regressions.

3.5.6. Short-run stock market reactions to appointments of female CEOs

So far, the results have shown that the interaction between female top managers and female directors exerts a positive impact on firms' accounting returns. If the higher accounting returns are a manifestation of improved operating efficiency of the firms, then stock markets should reward the gender interaction by responding positively to the appointments of female top managers to firms with female directors on the board. However, is this the case

[17] The Hansen *J* statistic of 1.75 is marginally significant with a *p*-value of 0.19. This result suggests that the instruments, especially the industry averages in nearby firms, would be not truly exogeneous. Thus, the results should be interpreted with caution.

in Chinese stock market? To answer this question, I exploit an event study methodology to assess the stock market reactions to the appointments of female CEOs to firms with different proportions of female directors on board.

I focus my analysis on CEO appointments with gender transition – namely, a female CEO is appointed to replace a male CEO, or a male CEO is appointed to replace a female CEO, because only these events relate to variation in the gender interaction. I create a binary variable, *Female CEO appointment*, which is equal to 1 if the newly appointed CEO is female, and 0 otherwise. *Female CEO appointment* is then multiplied by *%Female directors* to capture the gender interaction effect. I estimate cumulative abnormal returns (CARs) over two different event windows from day 0 to 1 and from –1 to 1, where day 0 is the CEO appointment announcement date. The expected return used to compute CAR comes from a market model with an equal-weighted index return as the market return for an estimation window (–149,–23) (in trading days) prior to the appointment announcement date. The mean CAR(0,1) around the CEO appointments in my sample is –0.20%, while the mean CAR (–1,1) is –0.18%.

In Panel A of Table 3.10, the coefficients on the interaction between *Female CEO appointment* and *%Female directors* are significantly negative, suggesting that the appointment of a female CEO leads to a more negative CAR in a firm with a higher proportion of female directors on its board. In Panel B, I find that the CARs surrounding female CEO appointments are significantly

Table 3.10 Stock Market Reactions to Appointments of Female CEOs

This table presents stock market reactions to the announcements of female CEO appointments, conditional upon the proportion of female directors on the board. The sample includes all appointments with gender transition. The dependent variable is *CAR* over a two- or three-day event window (day 0 is the appointment announcement date). *Female CEO appointment* is a dummy variable equal to 1 if the newly appointed CEO is female, and 0 otherwise. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

Panel A: Female directors	[1] CAR(0,1)	[2] CAR(0,1)	[3] CAR(-1,1)	[4] CAR(-1,1)
Female CEO appointment	0.027*	0.027	0.009	0.011
	[1.69]	[1.59]	[1.19]	[1.30]
%Female directors	0.125**	0.135**	0.051**	0.052*
	[2.37]	[2.29]	[1.99]	[1.93]
Female CEO appointment × %Female directors	-0.173**	-0.167**	-0.062*	-0.066*
	[-2.22]	[-1.99]	[-1.72]	[-1.66]
Ln(Board size)	-0.023*	-0.025	-0.014**	-0.011
	[-1.82]	[-1.62]	[-2.05]	[-1.26]
%Independent directors	-0.068	-0.087*	-0.039	-0.056*
	[-1.64]	[-1.77]	[-1.47]	[-1.80]
Ln(Management size)	0.018**	0.019**	0.006	0.004
	[2.51]	[2.09]	[1.40]	[0.66]
Leverage	0.015	0.018	-0.004	-0.003
	[1.24]	[1.30]	[-0.64]	[-0.42]
Ln(1+Sales growth)	-0.003	0.007	-0.002	0.003
	[-0.55]	[0.61]	[-0.70]	[0.37]
Ln(Assets)	0.002	0.001	0.002	0.003
	[0.64]	[0.38]	[1.38]	[1.25]
Ln(Firm age)	-0.005	-0.005	-0.002	-0.000
	[-1.08]	[-0.86]	[-0.72]	[-0.17]
Cash holding		0.003		0.011
		[0.12]		[0.71]
R&D		0.107		-1.223
		[0.03]		[-0.99]
Capital expenditure		0.041		0.013
		[0.59]		[0.41]
Government ownership		0.027		0.005
		[1.35]		[0.46]
Institutional ownership		-0.013		-0.006
		[-0.53]		[-0.42]
Managerial ownership		0.016		0.028
		[0.35]		[1.18]
Regional development		-0.000		-0.000
		[-0.06]		[-0.06]
Constant	-0.055	-0.049	-0.038	-0.052
	[-0.82]	[-0.68]	[-0.92]	[-1.21]
Industry fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.141	0.178	0.127	0.163
N	248	207	248	207

(Table 3.10 continued)

Panel B: Female executive/independent directors	[1]	[2]	[3]	[4]
	CAR(0,1)	CAR(0,1)	CAR(-1,1)	CAR(-1,1)
Female CEO appointment	0.027*	0.030*	0.01	0.013
	[1.74]	[1.77]	[1.24]	[1.52]
%Female executive directors	0.125**	0.139**	0.053*	0.057*
	[2.48]	[2.48]	[1.84]	[1.86]
%Female independent directors	0.125	0.119	0.046	0.036
	[1.26]	[1.04]	[1.09]	[0.80]
Female CEO appointment × %Female executive directors	-0.175**	-0.206**	-0.071*	-0.097**
	[-2.31]	[-2.37]	[-1.73]	[-2.13]
Female CEO appointment × %Female independent directors	-0.171	-0.11	-0.047	-0.019
	[-1.24]	[-0.71]	[-0.76]	[-0.27]
Ln(Board size)	-0.023*	-0.026	-0.014**	-0.012
	[-1.81]	[-1.65]	[-2.06]	[-1.34]
%Independent directors	-0.068	-0.084	-0.038	-0.054*
	[-1.56]	[-1.65]	[-1.40]	[-1.72]
Ln(Management size)	0.018**	0.019**	0.006	0.004
	[2.51]	[2.10]	[1.39]	[0.70]
Leverage	0.015	0.018	-0.004	-0.003
	[1.20]	[1.33]	[-0.60]	[-0.35]
Ln(1+Sales growth)	-0.003	0.008	-0.002	0.003
	[-0.55]	[0.70]	[-0.68]	[0.48]
Ln(Assets)	0.002	0.002	0.002	0.003
	[0.64]	[0.48]	[1.40]	[1.35]
Ln(Firm age)	-0.005	-0.005	-0.002	-0.000
	[-1.10]	[-0.85]	[-0.70]	[-0.14]
Cash holding		0.001		0.009
		[0.05]		[0.60]
R&D		0.262		-1.133
		[0.06]		[-0.89]
Capital expenditure		0.038		0.011
		[0.56]		[0.35]
Government ownership		0.027		0.005
		[1.33]		[0.44]
Institutional ownership		-0.011		-0.005
		[-0.46]		[-0.33]
Managerial ownership		0.02		0.031
		[0.42]		[1.30]
Regional development		0.000		0.000
		[0.09]		[0.12]
Constant	-0.056	-0.055	-0.04	-0.057
	[-0.82]	[-0.78]	[-0.97]	[-1.31]
Industry fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.141	0.182	0.128	0.17
N	248	207	248	207

related to women's board membership as executive directors but not as independent directors. That is, only the interaction between female CEOs and female executive directors is interpreted by the market as a significant event that materially shapes investors' expectation about firms' future performance. The result is consistent with my argument that the significant female interaction effect is present only when female directors have managerial power.

Surprisingly, different from my previous results that show that gender interaction increases ROA, the market-based analysis conveys a different picture – investors respond negatively to the intensified interaction among women.

3.5.7. Gender interaction, firm profitability and earnings management

I have shown that the gender interaction has a positive impact on firms' accounting returns but a negative impact on stock price performance. Since stock price is the present value of firms' future cash flows, the negative effect of the gender interaction on stock prices reflects investors' negative expectations about firms' future performance. However, why do investors interpret the gender interaction as an unfavourable practice when there is a noticeable improvement in the accounting returns? This result could be explained if the accounting rates of returns had been distorted by managers through earnings management. As the gender interaction connects the board to the top managers to some extent, the effectiveness of board monitoring would be undermined, yielding a negative effect on accounting quality (Agrawal & Chadha 2005). As a result, investors are likely to penalise such

firms. Furthermore, the interaction with female directors, especially with female executive directors, strengthens the managerial power of female top managers; therefore, they are more able to manipulate accounting numbers. Since the female top managers in my sample are mainly female CFOs (see Table 3.2), the earnings management argument is plausible.

In Table 3.11, I include earnings management as an additional control variable in the baseline model. *Earnings management* is the value of discretionary accruals calculated based on the modified Jones model (Dechow *et al.* 1995). The results show that *Earnings management* significantly increases ROA, which suggests that accounting profits can be inflated due to manipulation of discretionary accruals.

In Table 3.12, I turn to study the effect of gender interaction on earnings management. In Panel A, the coefficient on *%Female directors* represents the effect of board gender diversity on earnings management when the firm is led by men. The significantly negative coefficient suggests that board gender diversity curbs earnings manipulation in male-led firms. In addition, the coefficient on *Female top manager* × *%Female directors* is significantly positive, consistent with the argument that female top managers are more likely to manipulate earnings when they have close interactions with the board because there are more women on it. This finding possibly explains why the stock market reacts negatively to the addition of women top managers to firms with women directors on board.

Table 3.11 Earnings Management and Firm Profitability

This table presents OLS regressions of ROA on the interaction between female top managers and female board directors while controlling for earnings management. *Earnings management* is the value of discretionary accruals calculated based on the modified Jones model (Dechow *et al.* 1995). Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

Panel A: Female directors	[1] ROA	***Panel B: Female executive/independent directors***	[2] ROA
Earnings management	0.018***	Earnings management	0.018***
	[6.96]		[6.95]
Female top manager	0.000	Female top manager	0.000
	[0.08]		[0.15]
%Female directors	-0.007	%Female executive directors	-0.031**
	[-0.65]		[-2.13]
Female top manager × %Female directors	0.022	%Female independent directors	0.02
	[1.35]		[1.27]
Ln(Board size)	-0.002	Female top manager × %Female executive directors	0.038*
	[-0.47]		[1.75]
%Independent directors	0.001	Female top manager × %Female independent directors	0.007
	[0.05]		[0.30]
Ln(Management size)	-0.005*	Ln(Board size)	-0.001
	[-1.81]		[-0.34]
Leverage	-0.007	%Independent directors	-0.002
	[-1.16]		[-0.13]
Ln(1+Sales growth)	0.023***	Ln(Management size)	-0.005*
	[7.42]		[-1.82]
Ln(Assets)	0.006***	Leverage	-0.007
	[5.03]		[-1.14]
Ln(Firm age)	-0.001	Ln(1+Sales growth)	0.023***
	[-0.37]		[7.45]
Cash holding	0.088***	Ln(Assets)	0.006***
	[8.81]		[5.02]
R&D	0.005	Ln(Firm age)	-0.001
	[0.05]		[-0.44]
Capital expenditure	0.104***	Cash holding	0.088***
	[7.69]		[8.84]
Government ownership	0.010**	R&D	0.002

	[2.22]
Institutional ownership	0.030***
	[6.09]
Managerial ownership	0.032***
	[2.71]
Regional development	0.003***
	[5.61]
Constant	-0.101***
	[-4.18]
Industry fixed effect	Y
Year fixed effect	Y
R^2	0.112
N	15,691

	[0.02]
Capital expenditure	0.103***
	[7.60]
Government ownership	0.010**
	[2.23]
Institutional ownership	0.030***
	[6.12]
Managerial ownership	0.032***
	[2.70]
Regional development	0.003***
	[5.76]
Constant	-0.102***
	[-4.22]
Industry fixed effect	Y
Year fixed effect	Y
R^2	0.113
N	15,691

Table 3.12 Gender Interaction and Earnings Management

This table presents OLS regressions of earnings management on the interaction between female top manager and female board directors. *Earnings management* is the absolute value of discretionary accruals calculated based on the modified Jones model (Dechow *et al.* 1995). Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

Panel A: Female directors	[1] Earnings management
Female top manager	-0.017
	[-1.05]
%Female directors	-0.095**
	[-2.27]
Female top manager × %Female directors	0.206*
	[1.73]
Ln(Board size)	0.001
	[0.07]
%Independent directors	0.051
	[0.94]
Ln(Management size)	-0.031
	[-1.48]
Leverage	0.360***
	[2.99]
Ln(1+Sales growth)	-0.022
	[-1.40]
Ln(Assets)	-0.060***
	[-5.10]
Ln(Firm age)	0.005
	[0.88]
Cash holding	0.099**
	[2.21]
R&D	-0.297
	[-0.40]
Capital expenditure	0.251***
	[2.95]
Government ownership	0.036***
	[2.88]
Institutional ownership	-0.005

Panel B: Female executive/independent directors	[2] Earnings management
Female top manager	-0.017
	[-1.05]
%Female executive directors	-0.112*
	[-1.78]
%Female independent directors	-0.075*
	[-1.85]
Female top manager × %Female executive directors	0.212*
	[1.75]
Female top manager × %Female independent directors	0.205
	[1.36]
Ln(Board size)	0.002
	[0.10]
%Independent directors	0.049
	[0.92]
Ln(Management size)	-0.031
	[-1.48]
Leverage	0.360***
	[2.99]
Ln(1+Sales growth)	-0.022
	[-1.40]
Ln(Assets)	-0.060***
	[-5.10]
Ln(Firm age)	0.005
	[0.85]
Cash holding	0.099**
	[2.22]
R&D	-0.300
	[-0.41]
Capital expenditure	0.250***

	[-0.23]
Managerial ownership	-0.066**
	[-2.08]
Regional development	0.000
	[0.14]
Constant	1.217***
	[5.10]
Industry fixed effect	Y
Year fixed effect	Y
R^2	0.094
N	15,691

	[2.96]
Government ownership	0.036***
	[2.88]
Institutional ownership	-0.005
	[-0.23]
Managerial ownership	-0.066**
	[-2.07]
Regional development	0.000
	[0.18]
Constant	1.216***
	[5.11]
Industry fixed effect	Y
Year fixed effect	Y
R^2	0.094
N	15,691

In Panel B of Table 3.12, I find that the interaction between female top managers and female *executive* directors positively impacts earnings management, whereas the interaction between female top managers and female *independent* directors has no such effect. This is consistent with my previous finding that, only when female directors have managerial power, their interaction with female top managers can lead to measurable effects at the firm level.

3.5.8. Gender interaction and the pressure on women to perform

I test whether the pressure on women to perform causes the gender interaction effect. In the survey carried out by Ragins *et al.* (1998), the female senior executives in Fortune 1000 companies reported a perception of higher pressure to perform relative to their male peers. Specifically, about 99% of the surveyed women stated that they had to consistently over-perform to demonstrate their competence and to counter negative gender stereotypes in the workplace. Under such pressure, women would liaise to manipulate reported earnings, leading to unfavourable stock price movements.

If the performance pressure is present, female top managers with longer tenure are more entrenched in the firms and should experience less of the pressure and be less engaged in this behaviour. To test for this arugument, I decompose *Female top manager* into *Female top manager_New* and *Female top manager_Old* by the tenure of the female top managers. *Female top manager_New* is equal to 1 if a female CEO/CFO is newly appointed to the firm in a given year, and 0 otherwise. *Female top manager_Old* is equal to 1 if

the female CEO and the female CFO hold their positions for more than one year, and 0 otherwise. The two dummy variables are then multiplied by *%Female directors*.

In Table 3.13, I find that both *ROA* and *Earnings management* are significantly positively related to *Female top manager_New* × *%Female directors*, but not significantly related to *Female top manager_Old* × *%Female directors*. The results suggest that only the newly appointed female top managers are likely to collaborate with female board directors to manipulate accounting returns, as they face greater pressure to perform when initially assuming their top managerial role.

If gender interaction only induces earnings manipulation in the initial year of leadership, I would expect that the appointments of female top managers would not have a negative consequence on the firms' stock prices in the long run, far beyond the three-day event window I studied in Section 3.5.6. I examine the long-run stock market reaction to CEO appointments by using the buy-and-hold (B&H) returns.[18]

The average CEO tenure in my sample is three years. I thus examine the B&H returns up to three years post CEO appointments. The set of treatment firms comprises all firms that appoint a female CEO to replace a male

[18] $\text{B\&H return}_{iT} = \prod_0^T (1 + r_{it}) - 1$, where r_{it} is the stock return of firm *i* on day *t*, and *T* is the event window.

Table 3.13 Gender Interaction and the Pressure on Women to Perform

This table examines whether the pressure on women to perform affects gender interaction. *Female top manager* is decomposed into *Female top manager_New* and *Female top manager_Old*. *Female top manager_New* is equal to 1 if the female CEO/CFO is newly appointed in a given year, and 0 otherwise. *Female top manager_Old* is equal to 1 if *female top manager* is equal to 1 but there are no appointments of female top managers in the given year, and 0 otherwise. *Earnings management* is the sum of the absolute value of discretionary accruals over the previous three years, where discretionary accruals are calculated based on the modified Jones model (Dechow *et al.* 1995). Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 3.1.

	[1] ROA	[2] Earnings management
Female top manager_*New*	-0.011*	-0.010
	[-1.91]	[-1.03]
Female top manager_*Old*	0.001	-0.003
	[0.19]	[-0.59]
%Female directors	-0.014	-0.014
	[-1.22]	[-0.79]
Female top manager_*New* × %Female directors	0.071**	0.135**
	[2.28]	[2.55]
Female top manager_*Old* × %Female directors	0.029	0.018
	[1.63]	[0.75]
Ln(Board size)	-0.002	-0.002
	[-0.58]	[-0.37]
%Independent directors	0.002	-0.010
	[0.20]	[-0.67]
Ln(Management size)	-0.005*	-0.009**
	[-1.68]	[-2.39]
Leverage	-0.004	0.091***
	[-0.74]	[11.74]
Ln(1+Sales growth)	0.026***	-0.006
	[8.96]	[-1.63]
Ln(Assets)	0.006***	-0.025***
	[5.12]	[-15.53]
Ln(Firm age)	-0.001	0.000
	[-0.41]	[0.10]
Cash holding	0.094***	-0.009
	[9.49]	[-0.67]
R&D	-0.030	-0.626***
	[-0.26]	[-2.83]
Capital expenditure	0.112***	0.061**
	[8.28]	[2.36]
Government ownership	0.010**	0.006
	[2.21]	[0.99]
Institutional ownership	0.025***	0.010
	[5.04]	[1.45]
Managerial ownership	0.031***	-0.009
	[2.61]	[-0.47]
Regional development	0.003***	-0.001
	[5.75]	[-0.65]
Constant	-0.105***	0.605***
	[-4.41]	[17.67]
Industry fixed effect	Y	Y
Year fixed effect	Y	Y
R^2	0.103	0.192
N	16,545	15,674

CEO.[19] The firms with a constant male CEO (i.e., no CEO change) are chosen as control firms. I require that the treatment firms and their matched control firms have stock return data for at least 500 trading days for three consecutive years after the CEO appointments. I exclude the CEO appointments centring which an M&A occurs within three years. After these procedures, I obtain 216 CEO appointments with male-to-female gender transition.

I match treatment firms and control firms based on the following criteria: (1) the matched pairs are in the same year; (2) the market capitalisation of the control firm is within +/− 30% of the market capitalisation of the treatment firm; (3) the absolute difference in *%Female directors* between the treatment firm and the control firm is less than 0.01; and (4) the control firm has the closest market-to-book ratio to the treatment firm. Finally, I find 173 matched pairs for male-to-female CEO appointments.

Panel A of Table 3.14 shows that there are no significant post-matching differences in these variables between treatment and control firms. This result justifies my matching approach. Given that the ratio of *%Female directors* is nearly identical across the two groups, the group of treatment firms (male-to-

[19] Alternatively, I could study CEO appointments with gender transition from female to male. In this case, I can match 71 pairs, in which firms with constant female CEOs are chosen as control firms. Out of the 71 treatment firms, 47 (66.20%) firms are already in the treatment sample where the firm appoints a female CEO to replace a male CEO. To reduce the possibility that the stock markets may have priced the effect of male-to-female transition, I take the firms with male-to-female transition out of the sample and then do the matching. I find that the original matching criteria will give rise to matched pairs with significant differences across the two groups. Thus, in this matching, I require that the market capitalisation of the control firm should be within +/− 20% of the market capitalisation of the treatment firm. Finally, I am left with 11 matched pairs, and do not find meaningful results due to the limited number of observations.

Table 3.14 Gender Interaction and Long-Run Post-Appointment B&H Returns

This table presents long-run B&H returns over (0, 245 days), (0, 490 days), and (0, 735 days) after CEO appointments. Treatment firms are those in which a female CEO is appointed to replace a male CEO. Control firms are those without CEO appointments, and the CEOs in the control firms are male. Treatment and control firms are matched based on market capitalisation, market-to-book ratio, %Female directors, and year. The univariate tests are based on 173 matched pairs. Paired *t*-tests are used to generate the *t*-statistics for the difference in means, where ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Post-matching mean differences

Variable	Appointment firms	Matched firms	Difference	t-statistic	(p-value)
Market capitalization (in CNY millions)	3,690	3,580	105	1.560	(0.121)
%Female directors	0.180	0.180	0.000	0.397	(0.692)
Market-to-book ratio	3.680	3.190	0.490	1.441	(0.151)

Panel B: Mean B&H return

	Appointment firms	Matched firms	Difference	*t*-statistic	(*p*-value)
(0, 245 days)	0.133	0.238	-0.106**	-2.339	(0.021)
(0, 490 days)	0.328	0.397	-0.069	-0.819	(0.414)
(0, 735 days)	0.552	0.488	0.065	0.620	(0.536)

female CEO transition) are expected to show a stronger gender interaction after the female CEO is appointed, compared to the group of control firms (constant male CEO).

I then compute B&H returns over (0, 245), (0, 490), and (0, 735) event windows (in trading days), where day 0 is the CEO appointment date.[20] In Panel B of Table 3.14, I use paired *t*-tests to find out the statistical significance of the difference in B&H returns across the matched pairs. I show that, compared to control firms with constant male CEOs, treatment firms with female CEO appointments experience a drop in mean B&H return in the one-year period post the appointment. However, the mean B&H return of the treatment firms is not significantly different from that of the control firms when the appointed CEOs hold their positions for two or three years. The results corroborate my argument that female top managers face strong performance pressure in their first year in office, as they become more entrenched in the subsequent years they have less need to sugar-coat firm earnings, resulting in insignificant market effects.

If the stock market reacts to the gender interaction only in the first year after the CEO appointment, then it is unlikely that I would observe a statistical effect of the gender interaction on Tobin's Q, another prevalent measure of the long-run market-based performance in the longitudinal data. Following Firth *et al.* (2008), I calculate Tobin's Q of Chinese public firms *as* (*market value of equity + book value of long-term debt + book value of inventories + book value*

[20] On average, there are 245 trading days on China's stock exchanges.

of current liabilities – book value of current assets)/ (*book value of total assets*), where market value of equity is computed as (n*umber of tradable shares* × *stock price* + *number of non-tradable shares* × *stock price* × *30%*) to account for the illiquidity discount of non-tradable shares.[21] The untabulated OLS regression results show that the interaction between female top managers and female board directors has no significant effect on Tobin's Q.

[21] A typical Chinese public firm has three types of shares. *Common shares* are tradable on stock exchanges. *Restricted institutional shares* and *state shares* are not publicly tradable, and they can only be transferred privately or in auctions. As Chen and Xiong (2001) document, the price of non-tradable shares significantly deviates from that of tradable common shares, and the deviation varies with the quantity of non-tradable shares to be sold and also depends on whether the shares are sold privately or in auctions.

3.6. Conclusion

Given the minority status of women in top management and the growing pressure on women to perform, I argue that female top managers (female CEOs and CFOs) tend to collaborate with female board directors in decision-making process, leading to measurable effects on firm outcomes. The effect of the gender interaction is, however, difficult to predict. On the one hand, the interaction between female top managers and female board directors could impair firm performance due to the detrimental effect of cooperation on board monitoring. One the other hand, the gender interaction could improve firm performance due to the efficient information exchange in decision-making.

I test the two competing hypotheses, and show that the presence of female top managers has a larger increasing effect on ROA in a firm with a more gender-diverse board. However, investors respond negatively, which suggests that the higher ROA brought by the gender interaction may not reflect the improved operation efficiency. Further analysis shows that the opposite effects are related to earnings management. Female top managers with more support from female board directors are likely to manipulate earnings numbers to produce high accounting returns. This action then would be penalised by stock investors. Finally, I show that the significant gender interaction effects disappear when women hold their managerial roles for more than one year. A possible explanation is that as they become more entrenched in firms, the reduced performance pressure reduces their tendency for cooperation.

Collectively, the results provide some evidence that the greater pressure on women to perform engenders unfavourable gender interaction effects.

An alternative explanation to my results is that the higher conservatism of women (Huang & Kisgen 2013), rather than the pressure to perform, explains the earnings manipulation in my data, as Bertomeu *et al.* (2017) show that higher conservatism increases the equilibrium earnings manipulation. In this context, women tolerate more manipulation in order to exploit the benefit of a more conservative measurement system. I will explore this possibility in a follow-up paper.

The previous literature has largely investigated the separate effects of gender of top managers and gender diversity of corporate boards. This chapter complements the literature by showing that female top managers and female directors liaise to impact on firm outcomes. The significant interaction effects arise from female top managers' enhanced managerial power due to their interaction with female executive directors. Powerful women tend to collaborate. This collaboration is detrimental to investors as the firm's earnings manipulation intensifies.

This chapter extends the emerging research that investigates the dynamic relationships among women within firms. My study does not suggest that firms should avoid female CEOs/CFOs working alongside with other women directors. Rather, I argue that if the disproportionate performance pressure of women can be reduced, then the unfavourable gender interaction is unlikely to take place.

Chapter 4

Do Local Gender Equality Attitudes Affect Women's Representation on Corporate Boards?

4.1. Introduction

Cross-nationally, women are underrepresented on corporate boards (Adams & Kirchmaier 2015). Increasing board gender diversity is of great importance for policymakers. Norway, Germany, France, Belgium, Iceland and Italy have adopted mandatory gender quotas for boards; Austria, Finland, the Netherlands, Spain, Sweden and the UK have introduced voluntary codes to improve women's board representation (Wiersema & Mors 2016). If barriers to women's advancement to directorship are rooted in local institutional environments, such as negative attitudes and stereotypes about women's roles in society, then board restructuring policies that target firms may be ineffective and even cause low operational efficiency (e.g., Ahern & Dittmar 2012). If increased gender diversity is desirable for firms, then it would be necessary to take actions at a higher level and promote gender equality in local institutions, not merely in target firms.

Previous literature on this issue has largely focused on firm-level factors to examine what affects board gender diversity (Farrell & Hersch 2005; Hillman *et al.* 2007). A few studies exploit the cross-country varied institutional setting and investigate how country-specific socioeconomic development affects female board representation (Ferreira & Kirchmaier 2013; Adams & Kirchmaier 2015). The non-uniform institutional establishments across countries, such as

regulatory gender quotas and governance codes, challenge the study on the *informal* institutions' role in this issue.

This chapter employs the unique setting of China. First, the one-child policy and extended nuclear family culture in China allows me to control for potential omitted variable biases associated with the supply of women director candidates. For example, it has been documented that career breaks – usually related to childcare – have a detrimental effect on women's career progression (Bertrand *et al.* 2010). In China, most women have only one child and are aided by their extended families in rearing the child and, therefore, have less interrupted career progression.

Second, the lower status of women that is present in almost every culture in the world is less likely to adversely affect the quality of upbringing of women in China. When financial resources are scarce, it is natural to expect that a majority of families would invest in the human capital of males rather than that of females. In China, however, a girl who is the only child of her family is likely to be cherished and educated by the family as much as a boy. Thus, insufficient supply of women director candidates is less likely to be an issue in China than in other countries.

Third, the formal legal rules and regulations are generally identical across different provinces of China, but informal institutions such as cultures, values and traditions vary. In this setting, I study how the *informal* provincial-level gender equality values and beliefs, defined as *local gender equality attitudes*, influence board gender diversity.

I construct three categories of proxies to measure provincial-level gender equality beliefs. For the first category, I use enrolment data from Tsinghua University, the top-ranked STEM-oriented university in China, by tracing back students at this institution to the provinces where they grew up in. The gender composition of the newly enrolled students from each province is then used as the provincial-level gender equality proxy. Given the finding of Guiso *et al.* (2008) that gender equality is positively associated with mathematics performance, I claim that provinces with greater beliefs about gender equality are those having a higher percentage of female students entering the top STEM-oriented university. Proxies in the second category are derived from the Chinese General Social Survey, which contains a range of questions that can be used to infer provincial attitudes and stereotypes about gender differences in innate abilities, employment and career development, and family roles. The third category is based on the presence of female political role models in the provincial government and the communist party. The rationale is that those provinces with women in influential political positions are those with positive attitudes about gender equality.

I have several findings. First, board gender diversity is positively significantly related to the proportion of female students entering the top university. When looking into the students' major of subject in the university, I find that the significant relation holds only when examining the gender ratio of students who major in STEM subjects. One possible explanation is that only the gender gap in STEM subject performance relates to local gender equality attitudes (e.g., Guiso *et al.* 2008; Adams & Kirchmaier 2016).

Second, I show that board gender diversity is higher in a province where there is a stronger belief that women and men have equal intrinsic abilities. Traditional gender stereotypes argue that women are inferior to men in leadership positions because women in general are less competent and talented (Schein 1973; Oakley 2000). Previous studies (e.g., Guiso *et al.* 2003; Fortin 2005; Guiso *et al.* 2008) have used the World Value Survey to infer attitudes towards gender diversity but the questions available are not as clean as those derived from the Chinese survey (as I will discuss in section 4.3.1). Thus, my study provides the first convincing evidence that stronger gender equality beliefs in local informal institutions increase female board representation. In addition, I document consistent results by using other questions concerning the gender differences in employment opportunities, career goals and housework loads.

Third, 'female political role models' refer to those women who serve as the provincial governor (like the CEO of the province) or secretary of the provincial party standing committee (like the board chair of the province) in China. I find that corporate boards tend to be more gender-diverse when female role models are set at the top political level in the province.

I conduct a number of robustness tests and find the above relations continue to hold. First, I use the province-level random effects generalised least squares (GLS) estimator, which controls for cross-province heterogeneity and allows for inclusion of time-invariant provincial-level independent variables. Second, although by using Chinese data I am able to control for omitted variables that are potentially associated with supply-related variables, I

explicitly add a control for female labour supply and find the results unchanged. Third, if childcare service is available, women could be relieved from their motherhood-related duties and thus more likely to participate in the labour force (Kilburn & Datar 2002), which has potential effects on women directors' supply. However, my empirical results do not support this contention. There is little evidence that non-household childcare provision is associated with board gender diversity. An implication is that women's participation on corporate boards is not directly linked to the supply of women at grass-root levels. Even though there could be more women participating in the labour force, if the gender stereotypes exist and work against women, these women still cannot break the glass ceiling to the top corporate hierarchy. Finally, to deal with the multilevel structure of my data set, the baseline regression model is estimated at the aggregate province level. Alternatively, I show that the results are qualitatively unchanged when using firm-level regressions and including a variety of firm-level control variables.

This study contributes to the literature in two main ways. First, I provide the first evidence that greater beliefs towards gender equality can promote corporate board gender diversity in contemporary China. From an econometrics perspective, my study using provincial-level gender equality measurements within a single country can mitigate the endogeneity concern that challenges the cross-country studies based on the World Values Survey, such as Adams and Kirchmaier (2015).[22]

[22] Similar in spirit to my finding, Adams and Kirchmaier (2015) suggest that cross-country

Second, in contrast to Adams and Kirchmaier (2015) who find corporate board gender diversity also associated with female labour supply, my study shows that the base level female labour supply across provinces of China has no statistical effect on board gender diversity. Furthermore, my results suggest that the provision of professional childcare service, which can afford women more time to develop their professional careers, appears to exert no statistical impact on women's boardroom representation. The negative gender stereotypes regarding women's role in society seem more influential in the Chinese setting.

The rest of this chapter is organised as follows. Section 4.2 discusses the conceptual framework. Section 4.3 describes the data and the sample. Section 4.4 interprets the empirical results. Section 4.5 concludes this chapter.

---

cultural norms on gender equality is a factor influencing women's progression to boardrooms.

4.2. Conceptual framework

4.2.1. Division of gender roles in China

The division of gender roles between women and men has existed in China for centuries. As Greenhalgh (1985: 267) states, 'China's traditional family system was without doubt one of the most brutally patriarchal in the world. The legal, economic, physical, and ideological mechanisms by which it subordinated women have been detailed in many places and need no repetition'.

Ancient China is predominantly a labour intensive agricultural economy in great demand of male labour force in farming, construction and civil defence activities (Zhang 2016). Under the Confucian ideology pervasive in ancient China, having male descendants means the continuation of family blood. Sons are taken as life-time members of their natal family and caring for the well-being of their parents even after they are married. Therefore, parents usually invest a lot in their sons' education and upbringing relative to their daughters. Daughters will belong to their husband's extended family once married. Parents thus have less intention to bring them up in a fruitful way. Daughters' education becomes more oriented to training of merely feminine work such as housekeeping and childcare (Boserup 2007). As a result, women have been historically placed in a socially disadvantaged position relative to men.

Since the founding of the People's Republic of China in 1949, women's socioeconomic status has greatly improved, primarily due to establishment of modern legal rules and laws. The *Law on the Protection of Rights and Interests*

of Women ensures the equal rights of women and men in terms of education, health care and political participation. The *Labour Law* prohibits any kind of gender discrimination in employment and promotion practices. The *Inheritance Law* grants women the rights to inherit fortunes from their parents even after they are married, while in ancient China only sons have such rights.

Gender equality and women's development are important goals of the Chinese government to realise social harmony and justice. In China, children can receive nine-year free primary and secondary education in public schools. As Wu and Zhang (2010) document, the educational opportunities and college enrolments have significantly risen for women since the 1990s. Under the one-child policy, most Chinese families are allowed to have only one child. If the only child is a girl, the families will be willing to invest as much as they can in rearing the girl. Tsui and Rich (2002) document similar academic performance and engagement levels for girls and boys from single child families.

Despite the substantial improvement in women's social status, gender disparity has not disappeared. As the 2013 *Well-Being Development Report of China* reveals, women remain underrepresented in scientific research institutions, government authorities and senior positions in corporations.

4.2.2. Women's underrepresentation on board: Can gender equality attitudes in local communities help women break the glass ceiling?

In corporations, women are numerical minorities of the board of directors. As shown in Table 3.2 of chapter 3, only 11% of board members in Chinese listed firms are women. Current studies explore the determinants of female

representation on corporate boards in order to overcome the barriers to boardrooms.

The investigation has been carried out at both the micro firm level and macro institutional level. Several firm characteristics have been found to be related to female director representation. For instance, Farrell and Hersch (2005) show that a woman is likely to be added to the board when a female director steps down – a finding consistent with tokenism. Hillman *et al.* (2007) find that women are more likely to participate on the board of firms that are larger in size, in industries with higher female labour force participation, highly diversified in corporate strategy, and closely linked to other firms with women board directors.

Gender diversity on board is largely a socioeconomic issue. Standard economic models suggest that women are underrepresented in some occupations because of discrimination in the labour market. The taste-based discrimination literature (e.g., Eagly & Karau 2002; Becker 2010) argues that women are less likely than men to get promoted to leadership roles because of employers' prejudice and discriminatory tastes. In contrast, the statistical discrimination literature (e.g., Bielby & Baron 1986; Lazear & Rosen 1990) assumes that employers make statistical inferences about the productivity of women and men for a specific job. Employers may consider that women on average are more likely to quit their jobs because of maternity, and thus presume that women's productivity is lower than men's productivity. Hence, they would discriminate against women in making appointment or promotion decisions even without specific tastes.

Employ a data set of 28 European countries, Ferreira and Kirchmaier (2013) find that country-fixed effects explain more of the cross-sectional variation of board gender diversity than do firm and industry characteristics. Their study suggests board gender diversity being greatly driven by cross-country institutional factors. Furthermore, using a data set of 22 countries worldwide, Adams and Kirchmaier (2015) show that economic and cultural barriers (e.g., family-oriented policies regarding managing the work–family balance, discrimination in the labour market and traditional family values) as well as insufficient female labour supply inhibit women's progression to the board level.

A limitation of these cross-country studies is the difficulty in disentangling what is affected by formal institutions from that affected by informal institutions. As the formal institutional setting varies significantly across countries, it is especially challenging to include a complete control for its impact. The single-country analysis for China, where the formal legal rules and regulations are nearly identical across different regions, helps reduce this endogeneity concern.

In this study, I examine the effect of informal institutional environments, specifically local gender equality attitudes, on board gender diversity. China's law and institutions, including investor protection, corporate governance and government quality, are less developed than those of the U.S. and other developed countries (Allen *et al.* 2005). Informal institutions, such as local values, norms and beliefs, would be more influential in the Chinese economy. In addition, the informal institutions and social development differ widely

across China's provinces. The link between regional gender equality attitudes and board gender diversity, if it exists, should be evident. I expect that improved gender equality in local environments enhances board gender diversity in corporations.

4.2.3. Measurement of gender equality attitudes

The gender gap in mathematics performance reflect societal attitudes towards gender equality. Guiso *et al.* (2008) find that, on average, girls score lower in mathematics but higher in reading than boys, and that this gender disparity is not due to biological gender differences. The gender gap in mathematics scores can be shortened with improved gender equality, while the gender gap in reading scores is widened with it. Else-Quest *et al.* (2010) find that the cross-country gender gap in mathematics achievement can be reduced if the country adopts effective policies to enhance women's welfare and social status. Women's equal opportunity in schooling, participation in scientific research, and increased parliamentary representation can narrow the gender gap in mathematics.

Gender stereotypes generally portray women as less capable or talented than men, less devoted to their career, and more responsible for household chores. Considerable literature has compared the performance of women and men on tests of cognitive abilities and general intelligence, and shown that the gender-related differences are rather small and disappearing over time (Maccoby & Jacklin 1978; Hyde 1981; Feingold 1988; Hyde 1990). In corporations, it has been found that women managers possess as equally

qualified leadership abilities as men managers (Dobbins & Platz 1986). Furthermore, women's family roles can affect their commitment to the labour force and ultimate career success (Kirchmeyer 1998). Marriage and the anticipated shorter and more disrupted career life hinder women's acquisition of necessary work experience to take part in upper-level positions (Marini 1989). The gender differences in employment and career development opportunities signify gender inequality in the workplace and women's work–life preferences (Bielby & Baron 1986; Ohlott *et al.* 1994; Hakim 2006). In addition, stereotypical gender roles usually assign housework to the women of the family. Women's devotion to housework likely impedes their career advancement and pay increment (Becker 1985). The equitable housework division between women and men delineates gender equality in the household (e.g., Blair & Lichter 1991; Fuwa 2004; Hook 2010; Mencarini & Sironi 2010). Yu and Xie (2011) further show that as gender equality improves, women in China have more power in bargaining over housework division with their husbands.

Women's political representation in governments can promote gender equality in local communities. Chattopadhyay and Duflo (2004) find that the increased representation of women in Indian village councils affects policy decisions on local infrastructure construction in a way that caters to women's needs. Beaman *et al.* (2009) show that the prior exposure to female political leaders lessens negative stereotypes against female leaders and promotes perceptions of female leadership's effectiveness. These female political leaders serve as the role models motivating women at lower levels.

4.3. Sample construction

4.3.1. Data

There is a severe underrepresentation of women on corporate boards of STEM sectors (Adams & Kirchmaier 2016). Tsinghua University is the top-ranked university in China, internationally renowned for its education and scientific research in disciplines of science, technology, engineering and mathematics (STEM). The students recruited are elite students in their home provinces. They choose Tsinghua University as their priority mainly because they are interested and specialised in STEM subjects – mathematics is the fundamental. The national university entrance examination results show that women are less likely than men to get enrolled into Tsinghua University. The gender disparity in enrolment varies across provinces. Given the strong link between mathematics performance and gender equality, the gender composition of the new students recruited from different provinces, defined as *%Female freshmen in Tsinghua University*, reflects, to some extent, the provincial-level gender equality attitudes. I extract the gender details of the new students of Tsinghua University from public web sources. The data is available for the years 2006–2009, 2012 and 2013. The data also records the students' major of discipline in Tsinghua University.

To assess provincial values and beliefs about gender roles in society, I collect data from the Chinese General Social Survey (CGSS). Gender equality relates to six questions in this survey:

Q1: Men have inherently higher abilities than women;

Q2: In the economic downturn, women employees should be dismissed first;

Q3: Men should be career-oriented, and women should be family-oriented;

Q4: Men should undertake more housework than what they have done now;

Q5: Husband and wife should share housework equally;

Q6: For women, marrying a good man is more important than pursuing their own career.

I define these survey questions as *Gender role belief* questions. Q1 relates to societal beliefs about gender difference in innate abilities. The 'abilities' could simply mean physical strength. In general, men are physically stronger than women. Holding this belief may not reflect gender prejudice. Q2 is conceptually similar to the World Values Survey (WVS) question: 'When jobs are scarce, men should have more right to a job than women.' A critique is that this question may not measure gender equality. In economic downturns, jobs are scarce and maximising household earnings is likely to be the top priority of the family. If only one job can be kept, the wife is more likely to sacrifice her own career and stay at home for housekeeping because the husband typically earns more. Therefore, agreeing men have a priority over jobs may not precisely reflect one's gender role belief. Furthermore, Q3 and Q6 are related to gender differences in career–family goals. Q4 and Q5 describe gender division of household work.

Each of the CGSS questions asks respondents:

How do you place your view on the statement?

6: very strongly agree;

5: strongly agree;

4: slightly agree;

3: indifferent;

2: slightly disagree;

1: strongly disagree;

0: very strongly disagree.

It is important to note that whereas a higher score in questions 1, 2, 3 and 6 represents more gender inequality, a higher score in questions 4 and 5 represents more gender equality. I concentrate on clear agreements or disagreements to each question. I calculate the fraction of respondents scoring lower than 2 in questions 1, 2, 3 and 6, and the fraction of respondents scoring higher than 4 in questions 4 and 5.[23] As such, a higher fraction indicates higher gender equality in local attitudes about gender roles. The survey data is available for 28 provinces and municipalities in the years 2006, 2008, 2010, 2012 and 2013.[24]

For women's political empowerment, defined as *Female political role model*, I focus on two political roles. The first is the provincial governor – that

[23] Average scores of the responses are highly influenced by the large proportion of respondents who are indifferent to the question being asked and they do not add to my understanding of gender attitudes.

[24] Because the survey questionnaires do not record interviewees' gender, I cannot separate the attitudes of women from the attitudes of men.

is, the top officer of the provincial government. The other is the secretary of the provincial party standing committee – that is, the leader of the provincial subsidiary of the Chinese communist party. In a typical province, the party secretary has a slightly higher political ranking than the provincial governor. I collect the provincial governors and secretaries' gender information from public web sources. All the gender equality attitude proxies are defined in Table 4.1.

I use the firm-level board gender diversity data collected in chapter 3 for the period 2000–2014 to conduct this study. A limitation of my data is that the university enrolment and CGSS survey data is unavailable for a few sample years. To decide on the best way to fill in the missing data, I explore whether cross-provincial institutional variation or time-series variation is more powerful in predicting provincial-level board gender diversity.

A number of factors have potential impact on board gender diversity. As explanatory factors, I include provincial-level yearly GDP and GDP growth rate to account for the impact of economic development, because Mammen and Paxson (2000) show that women's work status and well-being are associated with economic development. Population birth rate and population density (per square kilometre) are included as controls for the general population. The fraction of women in the population (*%women*) captures the sex ratio in the general population. As women's education levels and marriage status are

Table 4.1 Variable Definitions

Variable	Description
%Female freshmen in Tsinghua University:	
School of Medical Science	The proportion of female students enrolled in the school of medical science of Tsinghua University, as a fraction of all students recruited by the university from the province
Schools of Humanities and Social Science	The proportion of female students enrolled in schools of humanities and social science of Tsinghua University, as a fraction of all students recruited by the university from the province
Schools of Physical Science, Technology and Engineering	The proportion of female students enrolled in the schools of physical science, technology and engineering of Tsinghua University, as a fraction of all students recruited by the university from the province
Total	The proportion of female students as a fraction of all students recruited by Tsinghua University from the province
Gender role attitude:	
Q1	The proportion of survey respondents who (very) strongly disagree with the argument 'men have inherently higher abilities than women'
Q2	The proportion of survey respondents who (very) strongly disagree with the argument 'in the economic downturn, women employees should be dismissed first'
Q3	The proportion of survey respondents who (very) strongly disagree with the argument 'men should be career-oriented, and women should be family-oriented'
Q4	The proportion of survey respondents who (very) strongly agree with the argument 'men should undertake more housework than what they have done now'
Q5	The proportion of survey respondents who (very) strongly agree with the argument 'husband and wife should share housework equally'
Q6	The proportion of survey respondents who (very) strongly disagree with the argument 'for women, marrying a good man is more important than pursuing their own career'
Female political role model:	
Presence of female provincial governor	A dummy variable equal to 1 if the governor of the provincial government is female, and 0 otherwise

Presence of female party secretary	A dummy variable equal to 1 if the secretary of the provincial party standing committee is female, and 0 otherwise
Total	A dummy variable equal to 1 if either the governor or the party secretary is female, and 0 otherwise
Provincial-level control variables:	
GDP	GDP in billion RMB
GDP growth	GDP growth rate
Birth rate	The number of births per 1,000 population
%women	The proportion of women as a fraction of the total population
%educated women	The proportion of women with above college education as a fraction of the female population
%married women	The proportion of married women as a fraction of the female population
Population density	The number of residents per square kilometre

potential determinants of women's labour market outcomes (Fortin 2005), I control for the proportion of women with above college education as a fraction of the female population (*%educated women*) and the proportion of married women as a fraction of the female population (*%married women*). The data comes from the China Statistical Yearbook.

Table 4.2 reports the mean values of these provincial-level variables in the province-year panel. The average GDP growth rate is 15.10%, which suggests that China's provincial economy has been growing very fast. The average sex ratio is 0.492, indicating that the gender composition of the total population is nearly balanced. As China is a developing country, the education level of women is still very low. Only 7.1% of women population have received above-college education. In addition, 81.16% of women population are married women.

In Table 4.3, I test how these provincial factors influence board gender diversity. The dependent variable is the average firm-level board gender diversity for each province-year, where board gender diversity is defined as the proportion of female directors on the board. All the independent variables are lagged by one year relative to the dependent variable in order to reduce simultaneity. The OLS regression results show that provincial-level board gender diversity increases with GDP, which corroborates the finding of Adams and Kirchmaier (2015) that economic development increases women's participation on corporate boards.

Table 4.2 Descriptive Statistics of Provincial-Level Control Variables

This table reports the mean values of the provincial-level control variables across provinces. The provincial-level variables are *GDP*, *GDP growth*, *birth rate*, *%women*, *%educated women*, *%married women* and *population density*. All the variables are defined in Table 4.1.

Province	GDP	GDP growth	Birth rate	%women	%educated women	%married women	Population density
Shanghai	1.161	12.65%	7.242	0.496	0.178	0.807	0.030
Yunnan	0.508	13.54%	14.324	0.484	0.036	0.835	0.001
Inner Mongolia	0.694	19.64%	9.621	0.489	0.075	0.839	0.000
Beijing	0.934	16.81%	7.288	0.489	0.267	0.763	0.010
Jilin	0.566	15.32%	7.206	0.493	0.070	0.820	0.001
Sichuan	1.135	14.39%	9.622	0.494	0.047	0.857	0.002
Tianjin	0.591	17.32%	7.905	0.503	0.153	0.804	0.010
Ningxia	0.105	17.80%	14.903	0.491	0.066	0.818	0.001
Anhui	0.822	13.87%	12.395	0.493	0.039	0.845	0.004
Shandong	2.556	14.71%	11.575	0.499	0.052	0.847	0.006
Shanxi	0.593	15.68%	11.553	0.489	0.065	0.825	0.002
Guangdong	3.029	14.88%	12.076	0.488	0.055	0.753	0.005
Guangxi	0.621	14.65%	14.005	0.480	0.042	0.809	0.002
Xinjiang	0.369	14.61%	16.024	0.491	0.099	0.786	0.000
Jiangsu	2.666	15.26%	9.365	0.508	0.068	0.854	0.007
Jiangxi	0.617	14.85%	13.919	0.490	0.045	0.848	0.003
Hebei	1.366	13.62%	12.555	0.493	0.048	0.830	0.004
Henan	1.493	14.42%	11.836	0.495	0.043	0.824	0.006
Zhejiang	1.816	14.55%	10.187	0.494	0.089	0.832	0.005
Hainan	0.138	14.22%	14.753	0.477	0.048	0.775	0.002
Hubei	1.047	13.83%	9.393	0.492	0.065	0.836	0.003
Hunan	1.041	14.93%	12.470	0.488	0.049	0.840	0.003
Gansu	0.280	14.27%	12.714	0.490	0.043	0.821	0.001
Fujian	0.980	13.57%	11.803	0.496	0.059	0.814	0.003
Tibet	0.035	15.77%	16.709	0.508	0.017	0.684	0.000
Guizhou	0.316	16.39%	14.622	0.484	0.040	0.823	0.002
Liaoning	1.214	13.99%	6.603	0.498	0.103	0.824	0.003
Chongqing	0.522	15.92%	9.852	0.495	0.049	0.859	0.004
Shaanxi	0.643	17.98%	10.215	0.491	0.068	0.830	0.002
Qinghai	0.087	16.47%	15.621	0.491	0.063	0.809	0.000
Heilongjiang	0.725	11.72%	7.571	0.493	0.064	0.839	0.001
Average	0.991	15.10%	11.500	0.492	0.071	0.816	0.004

Table 4.3 Board Gender Diversity and Fixed Effects Estimator

This table presents OLS regressions of provincial-level board gender diversity on a set of provincial-level independent variables. The sample is a province-year panel. All independent variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Dependent variable = Board gender diversity				
	[1]	[2]	[3]	[4]
GDP	0.005***	0.001	0.013***	0.010***
	[3.19]	[0.86]	[4.01]	[2.88]
GDP growth	0.008	0.099	0.018	0.081
	[0.26]	[1.36]	[0.76]	[1.66]
Birth rate	-0.001	-0.002	-0.000	0.001
	[-0.76]	[-0.97]	[-0.04]	[0.70]
%women	0.380	0.633**	-0.491*	-0.205
	[1.64]	[2.67]	[-1.90]	[-0.87]
%educated women	0.153	0.069	0.090	-0.110
	[1.31]	[0.65]	[1.04]	[-1.12]
%married women	-0.049	-0.050	0.006	-0.060
	[-0.65]	[-0.94]	[0.06]	[-0.53]
Population density	-1.934**	-1.365*	-2.402*	-1.399
	[-2.41]	[-1.93]	[-1.83]	[-1.43]
Constant	-0.035	-0.163	0.377**	0.275*
	[-0.23]	[-1.12]	[2.29]	[1.87]
Year fixed effect	No	Yes	No	Yes
Province fixed effect	No	No	Yes	Yes
Adj. R^2	0.189	0.257	0.671	0.688
N	341	341	341	341

Models 1–4 of Table 4.3 differ in the choice of fixed effects. Model 1 includes neither year- nor province-fixed effects. The adjusted R^2 is 18.9%, which means that the independent variables altogether explain 18.9% of variation in provincial-level board gender diversity. In model 2, I include year-fixed effects; the adjusted R^2 increases to 25.7%. In model 3, alternatively I include province-fixed effects; the adjusted R^2 increases to 67.1%. When both year- and province-fixed effects are incorporated into model 4, the adjusted R^2 rises to 68.8%. This analysis reveals that the cross-province differences explain a majority of the variation of board gender diversity, while the time-series changes within each province explain a rather limited portion. Therefore, to fully exploit the cross-provincial variation, I take the mean values of *%Female freshmen in Tsinghua University* and *Gender role attitude* variables across the available data years for each province to construct the provincial-level gender equality attitude proxies.

4.3.2. Descriptive statistics

In Table 4.4, I report the mean scores of the gender equality attitude proxies across 32 provinces and municipalities. For the first proxy, *%Female freshmen in Tsinghua University*, I observe in Panel A that on average only 31.3% of new students are female, which suggests that women are less likely than men to enter the top STEM-oriented university. It is noteworthy that the gender composition ratio differs substantially across disciplines. In the school of medical science, 48.3% of new students are women – nearly gender-balanced. In the schools of humanities and social science, 61.6% are women

Table 4.4 Descriptive Statistics of Gender Equality Attitude Proxies

This table describes the distributions of local gender equality attitude proxies and board gender diversity. Panels A, B and C report the mean values of the gender equality attitude proxies across provinces. Panel D reposts the summary statistics of board gender diversity across provinces. Panel E presents the correlations between the gender equality attitude proxies and board gender diversity. * indicates statistical significance at the 1% level. Variables are defined in Table 4.1.

Panel A	%Female freshmen in Tsinghua University			
Province	School of Medical Science	Schools of Humanities and Social Science	Schools of Physical Science, Technology and Engineering	Total
Shanghai	0.528	0.727	0.203	0.384
Yunnan	0.435	0.671	0.212	0.291
Inner Mongolia	0.556	0.548	0.222	0.307
Beijing	0.565	0.677	0.268	0.422
Jilin	0.394	0.689	0.224	0.327
Sichuan	0.569	0.671	0.213	0.337
Tianjin	0.551	0.594	0.230	0.342
Ningxia	0.764	0.576	0.206	0.303
Anhui	0.530	0.525	0.159	0.250
Shandong	0.481	0.528	0.182	0.332
Shanxi	0.542	0.589	0.199	0.304
Guangdong	0.559	0.610	0.134	0.299
Guangxi	0.319	0.606	0.237	0.306
Xinjiang	0.639	0.602	0.294	0.393
Jiangsu	0.588	0.686	0.220	0.377
Jiangxi	0.144	0.467	0.102	0.175
Hebei	0.566	0.640	0.166	0.339
Henan	0.572	0.544	0.185	0.276
Zhejiang	0.434	0.678	0.186	0.348
Hainan	0.300	0.631	0.216	0.329
Shenzhen	0.559	0.610	0.134	0.299
Hubei	0.463	0.598	0.175	0.288
Hunan	0.358	0.601	0.144	0.304
Gansu	0.581	0.670	0.183	0.268
Fujian	0.542	0.551	0.151	0.259
Tibet	0.000	0.864	0.297	0.380
Guizhou	0.319	0.449	0.189	0.223
Liaoning	0.478	0.593	0.178	0.325
Chongqing	0.558	0.593	0.163	0.320
Shaanxi	0.456	0.594	0.212	0.303
Qinghai	0.633	0.694	0.204	0.314
Heilongjiang	0.475	0.646	0.165	0.297
Average	0.483	0.616	0.195	0.313

(Table 4.4 continued)

Panel B	Gender role attitude					
Province	Q1	Q2	Q3	Q4	Q5	Q6
Shanghai	0.233	0.530	0.147	0.193	0.433	0.189
Yunnan	0.116	0.289	0.072	0.219	0.355	0.125
Inner Mongolia	0.196	0.303	0.100	0.414	0.652	0.144
Beijing	0.160	0.460	0.099	0.178	0.291	0.089
Jilin	0.118	0.331	0.069	0.500	0.296	0.082
Sichuan	0.112	0.288	0.080	0.237	0.274	0.110
Tianjin	0.159	0.424	0.073	0.194	0.326	0.123
Ningxia	0.189	0.556	0.093	-	0.504	0.098
Anhui	0.071	0.274	0.060	0.141	0.186	0.061
Shandong	0.115	0.331	0.063	0.226	0.326	0.084
Shanxi	0.089	0.281	0.060	0.267	0.193	0.082
Guangdong	0.106	0.354	0.059	0.135	0.265	0.071
Guangxi	0.084	0.300	0.068	0.247	0.264	0.082
Xinjiang	0.286	0.442	0.204	0.211	0.670	0.234
Jiangsu	0.098	0.333	0.057	0.316	0.241	0.077
Jiangxi	0.068	0.245	0.136	0.085	0.252	0.061
Hebei	0.103	0.223	0.051	0.115	0.229	0.058
Henan	0.121	0.251	0.040	0.153	0.286	0.077
Zhejiang	0.141	0.388	0.104	0.277	0.368	0.098
Hainan	0.180	0.375	0.140	0.235	0.500	0.140
Hubei	0.081	0.212	0.028	0.180	0.205	0.056
Hunan	0.100	0.293	0.053	0.060	0.252	0.067
Gansu	0.152	0.517	0.094	0.175	0.552	0.132
Fujian	0.100	0.266	0.056	0.148	0.318	0.075
Tibet	0.027	0.167	0.026	-	0.158	0.081
Guizhou	0.193	0.430	0.087	0.163	0.367	0.223
Liaoning	0.089	0.258	0.085	0.290	0.164	0.039
Chongqing	0.113	0.243	0.035	0.176	0.272	0.080
Shaanxi	0.135	0.271	0.064	0.203	0.314	0.097
Qinghai	0.436	0.630	0.208	-	0.636	0.152
Heilongjiang	0.103	0.227	0.066	0.119	0.265	0.081
Average	0.138	0.339	0.083	0.209	0.336	0.102

(Table 4.4 continued)

Panel C	Female political role model		
Province	Presence of female provincial governor	Presence of female party secretary	Total
Shanghai	0.000	0.000	0.000
Yunnan	0.000	0.000	0.000
Inner Mongolia	0.000	0.000	0.000
Beijing	0.000	0.000	0.000
Jilin	0.000	0.000	0.000
Sichuan	0.000	0.000	0.000
Tianjin	0.000	0.000	0.000
Ningxia	0.000	0.000	0.000
Anhui	0.067	0.000	0.067
Shandong	0.000	0.000	0.000
Shanxi	0.000	0.000	0.000
Guangdong	0.000	0.000	0.000
Guangxi	0.000	0.000	0.000
Xinjiang	0.000	0.000	0.000
Jiangsu	0.000	0.000	0.000
Jiangxi	0.000	0.000	0.000
Hebei	0.000	0.000	0.000
Henan	0.000	0.000	0.000
Zhejiang	0.000	0.000	0.000
Hainan	0.000	0.000	0.000
Shenzhen	0.000	0.000	0.000
Hubei	0.000	0.000	0.000
Hunan	0.000	0.000	0.000
Gansu	0.000	0.000	0.000
Fujian	0.000	0.200	0.200
Tibet	0.000	0.000	0.000
Guizhou	0.000	0.000	0.000
Liaoning	0.000	0.000	0.000
Chongqing	0.000	0.000	0.000
Shaanxi	0.000	0.000	0.000
Qinghai	0.333	0.000	0.333
Heilongjiang	0.000	0.000	0.000
Average	0.013	0.006	0.019

(Table 4.4 continued)

Panel D	Board Gender Diversity						
Province	Mean	SD	P1	P25	Median	P75	P99
Shanghai	0.101	0.106	0.000	0.000	0.100	0.167	0.444
Yunnan	0.086	0.084	0.000	0.000	0.091	0.111	0.333
Inner Mongolia	0.138	0.141	0.000	0.000	0.111	0.222	0.500
Beijing	0.102	0.102	0.000	0.000	0.095	0.154	0.429
Jilin	0.140	0.139	0.000	0.000	0.111	0.222	0.545
Sichuan	0.104	0.115	0.000	0.000	0.095	0.143	0.455
Tianjin	0.128	0.102	0.000	0.000	0.111	0.214	0.400
Ningxia	0.145	0.157	0.000	0.000	0.108	0.222	0.556
Anhui	0.093	0.101	0.000	0.000	0.091	0.143	0.385
Shandong	0.111	0.115	0.000	0.000	0.100	0.176	0.500
Shanxi	0.072	0.080	0.000	0.000	0.074	0.111	0.286
Guangdong	0.109	0.100	0.000	0.000	0.111	0.167	0.364
Guangxi	0.113	0.118	0.000	0.000	0.111	0.167	0.500
Xinjiang	0.128	0.099	0.000	0.067	0.111	0.200	0.400
Jiangsu	0.124	0.113	0.000	0.000	0.111	0.200	0.444
Jiangxi	0.090	0.080	0.000	0.000	0.091	0.143	0.286
Hebei	0.096	0.088	0.000	0.000	0.111	0.133	0.333
Henan	0.093	0.121	0.000	0.000	0.083	0.125	0.500
Zhejiang	0.122	0.113	0.000	0.000	0.111	0.200	0.444
Hainan	0.083	0.090	0.000	0.000	0.091	0.143	0.333
Shenzhen	0.125	0.110	0.000	0.000	0.111	0.200	0.429
Hubei	0.095	0.109	0.000	0.000	0.083	0.143	0.444
Hunan	0.097	0.102	0.000	0.000	0.091	0.143	0.364
Gansu	0.108	0.097	0.000	0.000	0.111	0.167	0.429
Fujian	0.125	0.110	0.000	0.000	0.111	0.200	0.444
Tibet	0.114	0.102	0.000	0.000	0.111	0.222	0.333
Guizhou	0.066	0.086	0.000	0.000	0.000	0.111	0.333
Liaoning	0.141	0.121	0.000	0.056	0.111	0.222	0.444
Chongqing	0.118	0.102	0.000	0.000	0.111	0.200	0.381
Shaanxi	0.115	0.127	0.000	0.000	0.111	0.167	0.556
Qinghai	0.115	0.107	0.000	0.000	0.091	0.154	0.500
Heilongjiang	0.112	0.124	0.000	0.000	0.106	0.182	0.556
Average	0.110	0.110	0.000	0.000	0.111	0.167	0.444

(Table 4.4 continued)

Panel E			[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Board gender diversity	[1]	%women on board	1													
%Female freshmen in Tsinghua University	[2]	School of Medical Science	0.241*	1												
	[3]	Schools of Humanities and Social Science	0.153*	-0.140*	1											
	[4]	Schools of Physical Science, Technology and Engineering	0.180*	-0.045	0.519*	1										
	[5]	Total	0.240*	0.202*	0.682*	0.698*	1									
Gender role attitude	[6]	Q1	0.132*	0.439*	0.055	0.272*	0.208*	1								
	[7]	Q2	0.128*	0.462*	0.097	0.231*	0.212*	0.811*	1							
	[8]	Q3	0.073	0.176*	0.020	0.221*	0.138*	0.824*	0.698*	1						
	[9]	Q4	0.388*	0.090	0.299*	0.509*	0.333*	0.166*	0.098	0.089	1					
	[10]	Q5	0.210*	0.378*	-0.015	0.294*	0.106	0.829*	0.710*	0.754*	0.244*	1				
	[11]	Q6	-0.05	0.133*	0.004	0.439*	0.161*	0.717*	0.618*	0.668*	0.106	0.750*	1			
Female political role model	[12]	Presence of female provincial governor	0.068	0.103	0.071	0.003	-0.022	0.361*	0.241*	0.264*	-0.037	0.185*	0.085	1		
	[13]	Presence of female party secretary	0.113	0.032	-0.067	-0.083	-0.088	-0.041	-0.053	-0.051	-0.057	-0.011	-0.048	-0.009	1	
	[14]	Total	0.121*	0.103	0.019	-0.046	-0.069	0.272*	0.167*	0.187*	-0.067	0.145*	0.042	0.814*	0.574*	1

– there are significantly more women than men. In the schools of physical science, technology and engineering, only 19.5% are women – women are severely underrepresented in STEM disciplines.

For each discipline, the cross-province difference is also non-negligible.[25] In the medical school, only 14.4% of students enrolled from Jiangxi province are women, while 76.4% of students coming from Ningxia province are women. In the schools of humanities and social science, only 44.9% of students from Guizhou province are women, while 72.7% of students from Shanghai are women. In the schools of physical science, technology and engineering, women represent 10.2% of all the students coming from Jiangxi province but 26.8% of the students from Beijing.

In Panel B of Table 4.4, I report the provincial scores of gender role attitudes based on each CGSS survey question. On average, 13.8% of respondents (very) strongly disagree that women are inherently less capable than men; 33.9% of respondents (very) strongly disagree that women employees should be laid off first in economic recession; only 8.3% of respondents (very) strongly disagree that men should be more career-oriented while women should be more family-oriented; 20.9% of respondents (very) strongly agree that men should do more housework than before; 33.6% of respondents (very) strongly agree that housework should be divided equally between women and men; 10.2% of respondents (very) strongly disagree that

[25] Tibet is the least developed region in China. Every year Tsinghua University recruits no more than ten students from Tibet. Due to the limited enrolment number, the student gender composition from Tibet could be an outlier. In the subsequent analysis, the regression results based on student enrolment continue to hold if Tibet is excluded from the sample.

marrying a good man is more important than pursuing their own career. This shows that the gender roles in China are far from being equal.

The gender role attitude also varies across provinces. For example, if I assess the attitude based on Q1, Tibet is the least gender-equal province, where only 2.7% of respondents (very) strongly disagree that women are inherently less capable than men; Qinghai is the most gender-equal province, where 43.6% of respondents (very) strongly refute that statement. The more noticeable provincial-level variation is seen in Q2. Only 16.7% of respondents in Tibet (very) strongly disagree that women should be dismissed first in economic downturns, while in Qinghai 63.7% of respondents (very) strongly refute the statement. For the other survey questions, the cross-province variation is also measurable.

The above results reveal that there is sufficient cross-province variation in the variables of *%Female freshmen in Tsinghua University* and *Gender role attitude* that can be employed for my cross-sectional analysis.

Regarding the female political role model, in Panel C of Table 4.4 I show that Chinese governments are predominantly led by men. Only two provinces, Anhui and Qinghai, have ever had female provincial governors in local governments. Only Fujian province has ever had a female secretary in the provincial party standing committee. This finding suggests that women are severely underpowered in provincial governments and communist party. From an econometric perspective, the lack of women in top political positions could

pose a challenge to finding a statistically significant result even if there existed a significant relation between role models and board gender diversity.

Using the board sample from chapter 3, I tabulate the distribution of board gender diversity across 32 provinces and municipalities of China in Panel D of Table 4.4. It is worth noting that the cross-sectional difference on board gender diversity is not negligible. Women are least represented on corporate boards in Guizhou province, where only 6.6% of directors are women; and are most represented in Ningxia province, where 14.5% of directors are women.

In Panel E of Table 4.4, I report the correlations between the gender equality attitude proxies and provincial-level board gender diversity. Board gender diversity is positively correlated with the three categories of gender equality proxies in terms of women's educational achievement, gender roles in society, and political empowerment.

4.4. Results

4.4.1. Gender disparity in educational achievement and board gender diversity

In Table 4.5, I regress provincial-level board gender diversity on *%Female freshmen in Tsinghua University* and provincial-level control variables. When I take the new students as a whole and disregard the academic discipline they are enrolled into, the result in model 4 shows that corporate boards are more gender-diverse in a province where a higher proportion of the students accepted by the university are women. More women being recruited from a province could potentially unveil a more gender-equal institutional environment that helps girls achieve academic success. However, there is the possibility that these high-achieving women are related to the pool of future female board directors, and therefore our proxy for gender attitudes is tangled with a supply argument.

To clarify this issue, I classify the academic divisions into three categories: (1) medical science, (2) humanities and social science, and (3) physical science, technology and engineering. In model 2, I find that *%Female freshmen* enrolled into the faculties of humanities and social science has no statistically significant effect on board gender diversity, while the gender diversity is significantly positively associated with *%Female freshmen* enrolled into the schools of physical science, technology and engineering in model 3 and the medical school as reported in model 1.

Table 4.5 Gender Disparity in Educational Achievement and Board Gender Diversity

This table presents OLS regressions of provincial-level board gender diversity on the gender disparity in educational achievement. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Dependent variable = Board gender diversity				
	[1]	[2]	[3]	[4]
%Female freshmen in Tsinghua University:				
School of Medical Science	0.041*			
	[1.73]			
Schools of Humanities and Social Science		0.061		
		[1.47]		
Schools of Physical Science, Technology and Engineering			0.142**	
			[2.39]	
Total				0.142**
				[2.33]
Control variables:				
GDP	0.000	0.002	0.003	0.001
	[0.17]	[1.22]	[1.52]	[0.39]
GDP growth	0.094	0.117	0.088	0.099
	[1.38]	[1.64]	[1.28]	[1.41]
Birth rate	-0.002	-0.001	-0.002	-0.002
	[-1.29]	[-0.80]	[-1.16]	[-0.98]
%women	0.613**	0.515*	0.536*	0.497*
	[2.74]	[1.96]	[2.02]	[1.79]
%educated women	0.010	0.084	0.024	0.014
	[0.11]	[0.78]	[0.24]	[0.14]
%married women	-0.118*	0.013	0.001	0.000
	[-1.83]	[0.20]	[0.02]	[0.01]
Population density	-1.210*	-1.483**	-1.192*	-1.383**
	[-1.84]	[-2.25]	[-1.78]	[-2.13]
Constant	-0.111	-0.201	-0.180	-0.180
	[-0.91]	[-1.34]	[-1.21]	[-1.14]
Year fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.293	0.277	0.286	0.297
N	341	341	341	341

If the proportion of female students is related to a plain supply argument, I should find a consistent relation across all academic divisions. As women are generally overrepresented in schools of humanities and social science (see Panel A of Table 4.4), the relation could be more statistically evident if the proxy captures the supply of women. Rather, the significant effect only appears in STEM-intensive disciplines. Given that local gender equality attitudes are particularly crucial to encouraging women to specialise in STEM subjects (e.g., Guiso *et al.* 2008), my results indicate that some firms have higher board gender diversity because in their province women are treated more equally. This means that board gender diversity is associated with provincial-level gender equality environments.

4.4.2. Gender role values and board gender diversity

In Table 4.6, I examine how provincial attitudes about gender roles affect board gender diversity. I show that high gender equality as reflected by a higher score derived from each survey question significantly increases women's representation on board.[26] The only exception is Q6. Its coefficient is statistically insignificant but is positive as expected. The results suggest that, if there is a stronger belief that women and men have equal intrinsic abilities (Q1), employment opportunities and career goals (Q2, Q3 and Q6) and

[26] In the above analysis, the provincial gender equality attitude is delineated through six questions on gender roles. Some of these questions are strongly correlated as shown in Panel E of Table 4.4 and it is difficult to decide on which question(s) to focus on without being arbitrary. In Appendix 1, I apply principal component factor analysis and extract the common factors from these separate questions. The conclusion remains similar.

Table 4.6 Gender Role Attitude and Board Gender Diversity

This table presents OLS regressions of provincial-level board gender diversity on the gender equality attitude variables derived from CGSS survey questions regarding gender roles in society. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Dependent variable = Board gender diversity						
	[1]	[2]	[3]	[4]	[5]	[6]
Gender role attitude:						
Q1	0.117***					
	[2.91]					
Q2		0.078**				
		[2.55]				
Q3			0.168*			
			[2.04]			
Q4				0.079**		
				[2.48]		
Q5					0.086***	
					[4.22]	
Q6						0.073
						[0.68]
Control variables:						
GDP	0.003*	0.003	0.003	0.002	0.004**	0.002
	[1.79]	[1.49]	[1.41]	[1.16]	[2.71]	[1.23]
GDP growth	0.079	0.077	0.106	0.043	0.064	0.087
	[1.24]	[1.13]	[1.55]	[0.63]	[1.22]	[1.29]
Birth rate	-0.003**	-0.003**	-0.003	-0.003	-0.003**	-0.002
	[-2.12]	[-2.34]	[-1.60]	[-1.65]	[-2.44]	[-1.27]
%women	0.628**	0.614**	0.655**	0.464	0.645**	0.651***
	[2.70]	[2.63]	[2.73]	[1.42]	[2.62]	[2.82]
%educated women	-0.004	-0.014	0.000	0.041	0.013	0.052
	[-0.05]	[-0.15]	[0.00]	[0.44]	[0.20]	[0.52]
%married women	-0.091	-0.084	-0.096	-0.048	-0.056	-0.062
	[-1.53]	[-1.48]	[-1.39]	[-0.87]	[-1.01]	[-1.12]
Population density	-1.428***	-1.578***	-1.465***	-1.154**	-1.392***	-1.497**
	[-3.06]	[-2.76]	[-2.88]	[-2.15]	[-3.34]	[-2.46]
Constant	-0.118	-0.125	-0.129	-0.080	-0.163	-0.160
	[-0.89]	[-0.96]	[-0.88]	[-0.54]	[-1.13]	[-1.12]
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.320	0.317	0.292	0.438	0.369	0.267
N	341	341	341	308	341	341

housework loads (Q4 and Q5), this reflects higher gender equality attitudes in local informal institutions and, therefore, facilitates women's progression to the board level.

4.4.3. Female political role model and board gender diversity

In Table 4.7, I study the relation between board gender diversity and the presence of female role models in political establishments. If the provincial government or communist party standing committee is governed by a female political leader, then positive attitudes about gender equality and women's effectiveness in leadership positions should be expected in the local communities, which could lead to higher board gender diversity. The results in model 1 and 2 show that the presence of female provincial governor and female party secretary is positively and significantly associated with board gender diversity. Since women have ever served as provincial governor or secretary in only three provinces (see Table 4.4 Panel C), the variation in these two women political empowerment proxies is not large and its statistical significance could be understated. In model 3, I create a dummy indicator *Total*, which is equal to1 if either governor or secretary is female, and 0 if both are male. The relation still holds.

4.4.4. Endogeneity

In this study, reverse causality – board gender diversity affecting provincial-level gender equality attitudes – is unlikely because board gender diversity is a firm-specific corporate characteristic and its effect on province

Table 4.7 Female Political Role Model and Board Gender Diversity

This table presents OLS regressions of provincial-level board gender diversity on the presence of female political role models in political establishments. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Dependent variable = Board gender diversity			
	[1]	[2]	[3]
Female political role model:			
Presence of female provincial governor	0.022*		
	[1.70]		
Presence of female party secretary		0.020**	
		[2.47]	
Total			0.022**
			[2.07]
Control variables:			
GDP	0.002	0.002	0.002
	[0.95]	[0.90]	[0.94]
GDP growth	0.097	0.101	0.096
	[1.28]	[1.40]	[1.27]
Birth rate	-0.002	-0.002	-0.002
	[-1.21]	[-1.10]	[-1.23]
%women	0.367	0.355	0.339
	[1.64]	[1.54]	[1.53]
%educated women	0.068	0.071	0.063
	[0.60]	[0.62]	[0.56]
%married women	-0.071	-0.064	-0.072
	[-1.16]	[-1.01]	[-1.16]
Population density	-1.366*	-1.362*	-1.339*
	[-1.91]	[-1.87]	[-1.88]
Constant	-0.010	-0.013	0.005
	[-0.08]	[-0.10]	[0.04]
Year fixed effect	Yes	Yes	Yes
Adj. R^2	0.246	0.238	0.249
N	341	341	341

wide informal attitudes and values seems implausible. Nonetheless, omitted variable concerns may still plague my results.

Two of my gender equality attitude proxies, *%Female freshmen in Tsinghua University* and *Gender role attitude*, are cross-sectional variables without time variation. To alleviate omitted variable concern, if I include province-fixed effects in the regressions, the fixed effects will absorb the time-invariant attitude proxies. As an attempt to overcome this endogeneity challenge, I use the random effects GLS estimator. This estimator works because it allows me to control for unexplained heterogeneity in board gender diversity across provinces, and more importantly, it generates meaningful coefficient estimates for province-level time-invariant explanatory factors.

In Table 4.8, the random effects GLS regression results show that board gender diversity increases with *%Female freshmen in Tsinghua University in schools of physical science, technology and engineering*, *Gender role* equality as assessed by the CGSS survey questions, and the proxies for *Female political role model*. Overall, the results are consistent with my baseline OLS regression results. Corporate boards are more gender-diverse when provincial attitudes about women's roles in society are more positive and supportive.

4.4.5. Is female labour supply a missing explanatory factor for board gender diversity?

Adams and Kirchmaier (2015) propose that increased female labour force participation and full-time employment by women enable the generation of a pipeline of potential female directors. An implication for my study is that the

Table 4.8 Random Effects GLS Estimation

This table presents province-level random effects GLS regressions of board gender diversity on the proxies for local gender equality attitudes. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Dependent variable = Board gender diversity	
%Female freshmen in Tsinghua University:	
School of Medical Science	0.037
	[1.13]
Schools of Humanities and Social Science	0.002
	[0.19]
Schools of Physical Science, Technology and Engineering	0.211***
	[2.82]
Total	0.185***
	[2.65]
Gender role attitude:	
Q1	0.107**
	[2.33]
Q2	0.071**
	[2.15]
Q3	0.133*
	[1.73]
Q4	0.092***
	[2.61]
Q5	0.078***
	[3.42]
Q6	0.065
	[0.57]
Female political role model:	
Presence of female provincial governor	0.015*
	[1.88]
Presence of female party secretary	0.024***
	[4.79]
Total	0.018***
	[3.20]

supply of female labour could be a missing factor explaining the heterogeneity of board gender diversity. To rule out this possibility, I explicitly add a control for female labour supply. *%working women* is women's labour force participation ratio, calculated as the proportion of working women as a fraction of the female population. The data is collected from the 2010 Population Census of China.

In Table 4.9 I show that the results for *%Female freshmen in Tsinghua University*, *Gender role attitude* and *Female political role model* are qualitatively unchanged when the control variable of *%working women* is incorporated into the regressions. In addition, *%working women* is not significantly related to board gender diversity, which implies that the supply of average women at lower levels in society has no direct effect on board gender diversity.

4.4.6. Childcare provision and board gender diversity

Most women, at some point in their careers, need to take time off for child rearing. Budig and England (2001) document that motherhood is associated with the gender gap in pay. Bertrand *et al.* (2010) further show that the relatively low income of women is due to women's motherhood-related career interruptions and the resultant short weekly working hours. Kilburn and Datar (2002) find that the sufficient provision of childcare service is conducive to women's participation in the labour force. It is thus possible that adequate non-household childcare service and the resultant longer working hours enhance

Table 4.9 Control for Female Labour Supply

This table presents OLS regressions of provincial-level board gender diversity on the proxies for local gender equality attitudes by controlling for provincial-level female labour supply (*%working women*). All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Panel A: Dependent variable = Board gender diversity				
	[1]	[2]	[3]	[4]
%Female freshmen in Tsinghua University:				
School of Medical Science	0.043*			
	[1.86]			
Schools of Humanities and Social Science		0.068		
		[1.40]		
Schools of Physical Science, Technology and Engineering			0.147**	
			[2.14]	
Total				0.148**
				[2.14]
Control variables:				
GDP	-0.001	0.003	0.003	0.001
	[-0.22]	[0.86]	[1.00]	[0.41]
GDP growth	0.095	0.119	0.087	0.099
	[1.38]	[1.64]	[1.28]	[1.41]
Birth rate	-0.002	-0.001	-0.002	-0.001
	[-1.33]	[-0.66]	[-1.08]	[-0.87]
%women	0.608***	0.504*	0.534*	0.493*
	[2.78]	[1.87]	[1.99]	[1.75]
%educated women	0.021	0.076	0.018	0.004
	[0.21]	[0.68]	[0.15]	[0.04]
%married women	-0.124*	0.022	0.004	0.004
	[-1.90]	[0.28]	[0.07]	[0.07]
Population density	-1.209*	-1.492**	-1.184*	-1.380**
	[-1.85]	[-2.27]	[-1.76]	[-2.13]
%working women	0.047	-0.034	-0.019	-0.026
	[0.40]	[-0.23]	[-0.14]	[-0.19]
Constant	-0.127	-0.192	-0.174	-0.171
	[-0.99]	[-1.23]	[-1.07]	[-1.01]
Year fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.294	0.276	0.285	0.296
N	341	341	341	341

(Table 4.9 continued)

Panel B: Dependent variable = Board gender diversity						
	[1]	[2]	[3]	[4]	[5]	[6]
Gender role attitude:						
Q1	0.117***					
	[2.94]					
Q2		0.078**				
		[2.55]				
Q3			0.168**			
			[2.05]			
Q4				0.077*		
				[1.90]		
Q5					0.086***	
					[4.20]	
Q6						0.073
						[0.67]
Control variables:						
GDP	0.003	0.002	0.002	0.002	0.004*	0.002
	[1.09]	[0.80]	[0.93]	[0.60]	[1.87]	[0.70]
GDP growth	0.080	0.077	0.107	0.044	0.064	0.088
	[1.25]	[1.13]	[1.55]	[0.64]	[1.23]	[1.30]
Birth rate	-0.003*	-0.003**	-0.003	-0.003	-0.003**	-0.002
	[-2.03]	[-2.27]	[-1.55]	[-1.56]	[-2.32]	[-1.25]
%women	0.626**	0.612**	0.653**	0.471	0.645**	0.649***
	[2.71]	[2.65]	[2.74]	[1.40]	[2.61]	[2.83]
%educated women	0.002	-0.006	0.006	0.045	0.012	0.057
	[0.02]	[-0.06]	[0.06]	[0.45]	[0.18]	[0.52]
%married women	-0.092	-0.085	-0.097	-0.053	-0.056	-0.063
	[-1.53]	[-1.50]	[-1.38]	[-0.82]	[-0.97]	[-1.12]
Population density	-1.430***	-1.582***	-1.467***	-1.155**	-1.392***	-1.497**
	[-3.07]	[-2.78]	[-2.88]	[-2.14]	[-3.33]	[-2.46]
%working women	0.021	0.028	0.018	0.022	-0.003	0.017
	[0.20]	[0.25]	[0.17]	[0.17]	[-0.03]	[0.14]
Constant	-0.126	-0.135	-0.136	-0.088	-0.162	-0.167
	[-0.93]	[-1.00]	[-0.92]	[-0.55]	[-1.14]	[-1.11]
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.318	0.316	0.291	0.437	0.367	0.265
N	341	341	341	308	341	341

(Table 4.9 continued)

Panel C: Dependent variable = Board gender diversity			
	[1]	[2]	[3]
Female political role model:			
Presence of female provincial governor	0.022		
	[1.70]		
Presence of female party secretary		0.020**	
		[2.46]	
Total			0.022**
			[2.06]
Control variables:			
GDP	0.001	0.001	0.001
	[0.47]	[0.43]	[0.46]
GDP growth	0.097	0.102	0.097
	[1.28]	[1.40]	[1.27]
Birth rate	-0.002	-0.002	-0.002
	[-1.19]	[-1.08]	[-1.21]
%women	0.365	0.352	0.337
	[1.65]	[1.55]	[1.54]
%educated women	0.075	0.077	0.070
	[0.62]	[0.64]	[0.58]
%married women	-0.073	-0.065	-0.074
	[-1.17]	[-1.02]	[-1.17]
Population density	-1.369*	-1.364*	-1.342*
	[-1.91]	[-1.87]	[-1.89]
%working women	0.025	0.024	0.026
	[0.21]	[0.20]	[0.22]
Constant	-0.020	-0.022	-0.004
	[-0.14]	[-0.15]	[-0.03]
Year fixed effect	Yes	Yes	Yes
Adj. R^2	0.244	0.236	0.248
N	341	341	341

women's commitment to careers and consequently increase their chances of rising to the boardroom.

To measure childcare provision, I use questionnaire data from the China Health and Nutrition Survey and compute three variables: the average days of child being cared outside home per week, the fraction of survey respondents having their child cared for in non-household, and the fraction of survey respondents having their child cared for in professional childcare facilities.[27] The surveys were carried out in 1991, 1993, 1997, 2000, 2004, 2006, 2009, 2011 in 12 provinces of China.[28] The constructed variables are provincial averages across available survey years.

In Table 4.10, I report the results of OLS regressions of provincial-level board gender diversity on childcare provision. Across models 1–3, the different proxies for childcare provision has no statistical effect on board gender diversity. This finding suggests that, even though provision of childcare may increase women's participation in the labour force, the supply of average women has no direct link to the gender composition at the top corporate ladder – the board of directors.

---

[27] Non-household refers to grandparents' home, other relatives' home, neighbours' home, childcare centre, primary school's pre-school, nursery school and other professional facilities. Professional childcare facilities refer to childcare centre, primary school's pre-school, nursery school and other professional facilities.

[28] The survey data is only available for 12 provinces out of 32 provinces in my sample. Including childcare provision as controls in replace of female labour supply in Table 4.11 will drop a large number of observations from my sample.

Table 4.10 Childcare Provision and Board Gender Diversity

This table presents OLS regressions of provincial-level board gender diversity on childcare provision. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = Board gender diversity			
	[1]	[2]	[3]
Childcare provision:			
# Days of child being cared outside home per week	0.023		
	[0.19]		
% Survey respondents having their child cared for in non-household		0.166	
		[0.98]	
% Survey respondents having their child cared for in professional childcare facilities			0.005
			[0.39]
Control variables:			
GDP	0.001	0.006	0.004
	[0.38]	[1.77]	[1.57]
GDP growth	0.099	0.059	0.038
	[1.36]	[0.92]	[0.61]
Birth rate	-0.002	-0.004	-0.006***
	[-0.95]	[-1.58]	[-3.54]
%women	0.631**	0.035	0.039
	[2.67]	[0.18]	[0.17]
%educated women	0.075	-0.194	-0.109
	[0.66]	[-1.72]	[-1.43]
%married women	-0.052	-0.143	-0.063
	[-0.94]	[-0.74]	[-0.37]
Population density	-1.368*	-0.593*	-0.336
	[-1.94]	[-1.82]	[-0.70]
Constant	-0.171	0.213	0.174
	[-1.13]	[0.94]	[0.87]
Year fixed effect	Yes	Yes	Yes
Adj. R^2	0.256	0.556	0.523
N	341	132	132

4.4.7. Local gender equality, childcare provision and firm-level board gender diversity

As the variable of focus in my study is provincial-level gender equality beliefs measures, the baseline regressions are estimated at the aggregate province level. Nonetheless, it is worth noting that board gender diversity is a firm-level characteristic. As a robustness test, I rerun the regressions at the firm level.

In Table 4.11, the dependent variable is firm-level board gender diversity. As independent variables, I include the province-level control variables and an array of firm-level control variables, including *Ln(Board size)*, *%Independent directors*, *Leverage*, *Ln(1+Sales growth)*, ROA, *Ln(Assets)*, *Ln(Firm age)*, and *Government ownership*, *Institutional ownership* and *Managerial ownership* – the same as what I have included in chapter 3. See Table 3.1 for detailed variable definitions. Furthermore, Adams and Ferreira (2009) show that firms in which male directors are more closely connected to female directors in other firms are more likely to add women to their boards. I thus control for *Male directors' connectedness to female directors*, calculated as the proportion of male directors with external board connections to female directors. I also control for *Director connectedness*, defined as the total number of external board seats held by all directors in the firm, as a proxy for the overall connectedness of the board. In addition, industry- (2-digit Global Industry Classification Standard codes) and year-fixed effects are included to account for industry-wide and yearly economic fluctuations, respectively.

Table 4.11 Local Gender Equality Attitudes and Firm-Level Board Gender Diversity

This table presents firm-level OLS regressions of board gender diversity on the proxies for local gender equality attitudes and childcare provision. The sample is a firm-year panel data set. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A:	Dependent variable = Board gender diversity			
	[1]	[2]	[3]	[4]
%Female freshmen in Tsinghua University:				
School of Medical Science	0.002			
	[0.36]			
Schools of Humanities and Social Science		-0.011		
		[-1.01]		
Schools of Physical Science, Technology and Engineering			0.045*	
			[1.83]	
Total				0.007
				[0.30]
Control variables:				
Ln(Board size)	0.001	0.001	0.001	0.001
	[0.12]	[0.13]	[0.14]	[0.12]
%Independent directors	0.003	0.002	0.003	0.003
	[0.12]	[0.12]	[0.13]	[0.12]
Leverage	0.750	0.748	0.719	0.761
	[0.10]	[0.10]	[0.09]	[0.10]
Ln(1+Sales growth)	-0.004*	-0.004*	-0.004*	-0.004*
	[-1.77]	[-1.74]	[-1.78]	[-1.78]
ROA	0.014	0.015	0.015	0.014
	[0.84]	[0.85]	[0.88]	[0.84]
Ln(Assets)	-0.009***	-0.009***	-0.009***	-0.009***
	[-5.64]	[-5.67]	[-5.63]	[-5.64]
Ln(Firm age)	-0.003	-0.003	-0.003	-0.003
	[-1.20]	[-1.19]	[-1.23]	[-1.21]
Government ownership	-0.032***	-0.033***	-0.032***	-0.032***
	[-4.44]	[-4.46]	[-4.42]	[-4.43]
Institutional ownership	-0.000	-0.000	-0.000	-0.000
	[-0.06]	[-0.05]	[-0.05]	[-0.05]
Managerial ownership	0.047	0.046	0.047	0.047
	[1.55]	[1.53]	[1.57]	[1.55]
%Male directors with external connections to female directors	0.036*	0.036*	0.036*	0.036*
	[1.74]	[1.75]	[1.77]	[1.75]
Director connectedness	-0.005***	-0.005***	-0.005***	-0.005***
	[-4.28]	[-4.28]	[-4.29]	[-4.29]
GDP	0.001	0.001	0.001	0.001
	[0.40]	[0.40]	[0.50]	[0.40]
GDP growth	0.025	0.027	0.029	0.027
	[0.52]	[0.55]	[0.59]	[0.55]
Birth rate	-0.003**	-0.003**	-0.003**	-0.003**
	[-2.28]	[-2.38]	[-2.32]	[-2.26]
%women	0.420**	0.456***	0.402**	0.418**
	[2.45]	[2.66]	[2.35]	[2.46]
%educated women	-0.008	-0.007	-0.024	-0.011
	[-0.21]	[-0.18]	[-0.58]	[-0.26]

%married women	-0.056	-0.059	-0.057	-0.056
	[-0.94]	[-0.99]	[-0.97]	[-0.94]
Population density	-0.488	-0.461	-0.395	-0.483
	[-1.64]	[-1.55]	[-1.31]	[-1.63]
Constant	0.149	0.144	0.150	0.149
	[1.51]	[1.45]	[1.52]	[1.51]
Industry fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.064	0.064	0.064	0.064
N	14325	14325	14325	14325

Panel B:	Dependent variable = Board gender diversity					
	[1]	[2]	[3]	[4]	[5]	[6]
Gender role attitude:						
Q1	0.151***					
	[3.35]					
Q2		0.072**				
		[2.24]				
Q3			0.229***			
			[3.15]			
Q4				0.067*		
				[1.68]		
Q5					0.081***	
					[3.32]	
Q6						0.131**
						[2.05]
Firm-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Province-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.067	0.065	0.066	0.066	0.068	0.065
N	14325	14325	14325	14021	14325	14325

Panel C:	Dependent variable = Board gender diversity		
	[1]	[2]	[3]
Female political role model:			
Presence of female provincial governor	0.004		
	[0.51]		
Presence of female party secretary		0.020*	
		[1.81]	
Total			0.012*
			[1.80]
Firm-level controls	Yes	Yes	Yes
Province-level controls	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Adj. R^2	0.076	0.076	0.076
N	14325	14325	14325

(Table 4.11 continued)

Panel D:	Dependent variable = Board gender diversity		
	[1]	[2]	[3]

Childcare provision:			
# Days of child being cared outside home per week	0.009		
	[0.82]		
% Survey respondents having their child cared for in non-household		-0.019	
		[-0.21]	
% Survey respondents having their child cared for in professional childcare facilities			0.035
			[0.27]
Firm-level controls	Yes	Yes	Yes
Province-level controls	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Adj. R^2	0.078	0.078	0.078
N	7368	7368	7368

Table 4.11 reports OLS regressions of firm-level board gender diversity on provincial-level gender equality proxies. The data set has a multilevel structure, where firms are nested within provinces. Using OLS regressions to estimate the model has two limitations. One is the disproportionate representation of provinces in the firm-level sample. Large provinces that more represent the sample could drive the regression results. The other limitation is regarding clustering. If the residuals are correlated across provinces, then using firm-level clustering will cause biases on standard errors. Nonetheless, the main findings are qualitatively unchanged in the firm-level regressions, although the statistical significance is much lower, which is mainly because the variation of gender equality belief proxies is rather limited in the large firm-year sample. Panel D reports the relation between firm-level board gender diversity and provincial-level childcare provision. The relation remains statistically insignificant. Furthermore, I find that China's corporate boards tend to be less gender-diverse in larger firms and in government-controlled firms. In the untabulated regression results, I further include industry × year dummies. These findings continue to hold.

4.5. Conclusion

The underrepresentation of women on corporate boards has long been the focus of financial research (e.g., Adams & Kirchmaier 2015). I employ the unique setting of China, where the one-child policy minimises the omitted variable biases associated with the supply of women director candidates and the socioeconomic development varies significantly across different provinces of China. I test whether the measurable cross-province variation in gender equality attitudes leads to different levels of board gender diversity.

The provincial-level gender equality attitudes are measured by (1) the gender composition of the student enrolment from different provinces into Tsinghua University, the top-ranked STEM-oriented university in China; (2) the attitudes and beliefs about the gender differences in intrinsic abilities, employment opportunities and career development, and housework division from the Chinese General Social Survey; and (3) the existence of female political role models in the provincial government and communist party. I find robust evidence that in a province with positive attitudes towards gender equality, the corporate boards tend to be gender-diverse. Meanwhile, there is little evidence that female labour supply or non-household childcare provision would improve board gender diversity. Collectively, these findings suggest that board gender diversity is primarily associated with gender equality attitudes. An important policymaking implication is that the gender equality policies targeting institutional-level gender attitudes would be beneficial to women's career progression to the boardroom.

Chapter 5

Conclusion

Practices and policies for improving corporate governance of Chinese firms are imperative in light of the weak legal system and poor investor protection in China (Allen *et al.* 2005; Jiang & Kim 2015). Building on contemporary studies on corporate governance of Chinese firms (e.g., Fan *et al.* 2007; Liu & Lu 2007; Giannetti *et al.* 2015), this thesis is dedicated to the specific research field on how managerial characteristics affect firm outcomes.

Extant literature has shown that managers' personal characteristics affect their managerial style in voluntary corporate financial disclosure (Bamber et al. 2010) and that gender impacts managerial behaviour (Huang & Kisgen 2013). Extending these articles that are focused on U.S. firms, this thesis carried out three further studies using the unique Chinese setting. The first study investigates the role of board secretaries in voluntary disclosure of management earnings forecasts. Board secretaries are a unique top managerial post for information disclosure in Chinese firms. I study how board secretaries' personal characteristics, including professional expertise, political connection, role duality and equity holdings, influence management forecast disclosure. The second study uses the relatively high representation of women on the board of directors of Chinese firms, and studies whether women would interact with each other and make an impact on corporate governance and performance. Using the imbalanced socioeconomic development across China's provinces and the resultant large variation in gender equality beliefs,

the third study investigates whether the barriers for women to corporate board rooms are rooted in societal ideology about women.

5.1. Summary of findings

In the first study, I find that management earnings forecast quality is positively associated with board secretaries' legal expertise, accounting expertise, foreign experience, dual senior titles and equity ownership, and is negatively associated with their membership in the Chinese communist party. Furthermore, board secretaries with accounting expertise, dual senior roles and equity ownership tend to issue bad news forecasts. Board secretaries who deliver more accurate earnings forecasts tend to earn more and have a lower likelihood of being replaced. Finally, I document a pervasive impact of board secretaries on other corporate issues, including corporate governance, business ethics, investment strategy and firm performance.

In the second study, I examine the gender interaction effect between female top managers and female board directors. I argue that due to the growing pressure on women to perform, female top managers tend to cooperate with female board directors in the decision-making process, leading to measurable effects on firm outcomes. I show that the presence of female top managers has a larger increasing effect on ROA when there are more women on the firm's board of directors. However, this gender interaction results in a negative stock price reaction. The further analysis reveals that the opposite effects on accounting and market-based performance measures are caused by earnings management. Under the increased pressure for

performance, female top managers in collaboration with female board directors are likely to manipulate earnings, which produces high accounting returns.

In the third study, I study the sources of gender diversity of corporate boards. I test whether the measurable cross-province variation in gender equality beliefs is associated with board gender diversity. I use novel data sets to measure provincial-level societal values towards gender equality. First, I use the gender composition of the student enrolment from different provinces into Tsinghua University, the top-ranked STEM-oriented university in China. Second, I use the Chinese General Social Survey and construct measures of average societal beliefs about gender differences in intrinsic abilities, career development and household workload. Third, I assume that the presence of female political role models in provincial governments indicates higher gender equality. Overall, I find robust evidence that in a province with more positive values and beliefs about women's roles in society, the corporate boards are more gender-diverse.

5.2. Contributions

This thesis contributes to the literature in the following ways. First, the first study on the role of board secretaries opens a new research avenue for the top management team (TMT) studies. This study also adds to the management forecast literature by documenting a new managerial determinant of the forecast quality. I provide original evidence that the forecast quality is affected by board secretaries' characteristics. This study also complements the business ethics literature (Rogers & Stocken 2005; Slater & Dixon-Fowler

2009; Chen et al. 2016; Lee 2017), as accurate and timely management forecast disclosure can protect investors and is a business ethics issue.

The second study on gender interaction bridges two strands of literature on the presence of female leadership in the TMT and the gender diversity of the board of directors. Further, this study extends the work of Amore et al. (2014) by showing that the gender interaction between female top managers and female board directors leads to a short-lived increment in ROA, which is a result of earnings management. This study also complements the general literature on diversity, such as racial diversity (Richard 2000; Richard et al. 2004), cognitive diversity (Kilduff et al. 2000) and TMT heterogeneity (Pegels et al. 2000; Carpenter 2002).

The third study on the sources of board gender diversity provides the first evidence that improved provincial-level gender equality environments promote board gender diversity in contemporary China. It further shows that the base level female labour supply and the provision of childcare service have no statistical effects on board gender diversity. These supply factors appear not to inhibit women from rising to corporate boards. The gender inequality ideology about women's roles in society seem more influential.

This thesis has important implications for regulators, investors and policymakers. First, given the influential role of board secretaries in management forecast disclosure, regulators in China should closely monitor the practices of board secretaries in voluntary corporate information disclosure in order to increase corporate information transparency. Second, investors

should carefully consider the side effect of high female representation in corporations. When women represent a significant faction of the top management team as well as the board of directors, the gender interaction between the two would take place, leading to inflated accounting returns, which is due to earnings management. Third, policymakers in China who target the gender composition of corporate boards to improve board monitoring and corporate governance should take actions to overcome the socioeconomic barriers in women's career development especially in local communities where women's societal role is undervalued.

5.3. Limitations of research

This thesis has several limitations worth further investigation. First, as I have discussed in the first study, board secretaries are the persons *disclosing* management earnings forecasts to the public. However, the forecasted earnings numbers are actually produced by the CFOs. Although my empirical results suggest an influential role of board secretaries in forecast quality, the specific mechanism through which board secretaries impact the financial forecasting process remains obscure.

Second, the first study examines a variety of characteristics of the board secretaries, and these managerial characteristics could be endogenously chosen by the firms to suit their operating strategies. Because I do not have enough instrumental variables to carry out the rigorous 2SLS tests, I am unable to strenuously address the endogeneity issue.

Third, the second study documents opposite effect of gender interaction on accounting returns and stock prices. I have proposed an earnings management-based explanation to reconcile the conflicting results. However, it can be seen in Table 3.12 that the impact of gender interaction on earnings management is significant at the *10%* significance level. Some omitted factors could be driving the opposite results.

Fourth, the third study uses survey data to create provincial-level gender equality proxies. Since there are large missing observations in the time-series of the survey data, I only exploit the cross-sectional variation of the data to construct these proxies. This makes the endogeneity tests rather difficult, as fixed effects and dynamic panel GMM estimators cannot be used if the variables have no time-series variation.

Fifth, in the third study, I argue that due to the one-child policy, Chinese women are likely to have equal access to education and resources of their family as men and are less interrupted in their career progression, so that the inadequate supply of qualified female director candidates is unlikely to be an issue in the Chinese setting. As an attempt to further control for the supply of women and disentangle the supply issue from the gender equality issue, I include female labour force participation and childcare provision as control variables. It is still worthwhile to find more rigorous measures to capture the supply effect.

Finally, as this thesis studies many unique features of Chinese companies, admittedly some of my results cannot be generalised to the non-Chinese

context. First, the post of board secretaries in information disclosure is unique to Chinese companies, while in other countries it is more likely that CEOs and CFOs release corporate financial information, and company secretaries in these countries are more like coordinators of corporate matters. Even though my findings for Chinese board secretaries would not have direct implications for improving voluntary information disclosure in other countries, my evidence suggests that in other countries managerial characteristics could also affect the managers' practice in information disclosure. It is worthwhile to further study which managerial characteristic is preferable in the non-Chinese context. Second, some advanced economies such as Norway have mandated gender quotas at the board level, and the societal-level gender equality is substantially high. Further increasing gender equality in these countries may not have desirable effects. In view of the unappealing gender interaction effect I documented in the second study, when women make up a notable faction of the top management team as well as the board of directors, an undesirable gender interaction effect would take place. In the Chinese context, I argue that this is due to the strong pressure for women to perform. However, in developed countries (e.g., Norway), whether such an expectation for women to outperform exists is a question worthy of further investigation.

Bibliography

Aabo, T., Fraser, J.R., Simkins, B.J., 2005. The rise and evolution of the chief risk officer: Enterprise risk management at Hydro One. *Journal of Applied Corporate Finance* 17, 62-75.

Adams, R.B., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics* 94, 291-309.

Adams, R.B., Funk, P., 2012. Beyond the glass ceiling: Does gender matter? *Management Science* 58, 219-235.

Adams, R.B., Kirchmaier, T., 2015. Barriers to boardrooms. Unpublished Working Paper.

Adams, R.B., Kirchmaier, T., 2016. Women on boards in finance and STEM industries. *American Economic Review* 106, 277-281.

Agrawal, A., Chadha, S., 2005. Corporate governance and accounting scandals. *Journal of Law and Economics* 48, 371-406.

Ahern, K.R., Dittmar, A.K., 2012. The changing of the boards: The impact on firm valuation of mandated female board representation. *Quarterly Journal of Economics* 127, 137-197.

Ajinkya, B., Bhojraj, S., Sengupta, P., 2005. The association between outside directors, institutional investors and the properties of management earnings forecasts. *Journal of Accounting Research* 43, 343-376.

Allen, F., Qian, J., Qian, M., 2005. Law, finance, and economic growth in China. *Journal of Financial Economics* 77, 57-116.

Amore, M.D., Garofalo, O., Minichilli, A., 2014. Gender interactions within the family firm. *Management Science* 60, 1083-1097.

Anilowski, C., Feng, M., Skinner, D.J., 2007. Does earnings guidance affect market returns? The nature and information content of aggregate earnings guidance. *Journal of Accounting and Economics* 44, 36-63.

Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics* 68, 29-51.

Ayyagari, M., Demirgüç-Kunt, A., Maksimovic, V., 2010. Formal versus informal

finance: Evidence from China. *Review of Financial Studies* 23, 3048-3097.

Baginski, S.P., Hassell, J.M., 1997. Determinants of management forecast precision. *The Accounting Review*, 303-312.

Baik, B., Farber, D.B., Lee, S.S., 2011. CEO ability and management earnings forecasts. *Contemporary Accounting Research* 28, 1645-1668.

Bamber, L.S., Cheon, Y.S., 1998. Discretionary management earnings forecast disclosures: Antecedents and outcomes associated with forecast venue and forecast specificity choices. *Journal of Accounting Research* 36, 167-190.

Bamber, L.S., Jiang, J., Wang, I.Y., 2010. What's my style? The influence of top managers on voluntary corporate financial disclosure. *The Accounting Review* 85, 1131-1162.

Beaman, L., Chattopadhyay, R., Duflo, E., Pande, R., Topalova, P., 2009. Powerful women: Does exposure reduce bias? *Quarterly Journal of Economics* 124, 1497-1540.

Beck, T., Behr, P., Guettler, A., 2013. Gender and banking: Are women better loan officers? *Review of Finance* 17, 1279-1321.

Becker, G.S., 1985. Human capital, effort, and the sexual division of labor. *Journal of Labor Economics* 3, S33-S58.

Becker, G.S., 2010. The economics of discrimination. University of Chicago Press.

Bergstresser, D., Philippon, T., 2006. CEO incentives and earnings management. *Journal of Financial Economics* 80, 511-529.

Bertomeu, J., Darrough, M., Xue, W., 2017. Optimal conservatism with earnings manipulation. *Contemporary Accounting Research* 34, 252-284.

Bertrand, M., Goldin, C., Katz, L.F., 2010. Dynamics of the gender gap for young professionals in the financial and corporate sectors. *American Economic Journal: Applied Economics* 2, 228-255.

Bielby, W.T., Baron, J.N., 1986. Men and women at work: Sex segregation and statistical discrimination. *American Journal of Sociology* 91, 759-799.

Bird, R.C., Borochin, P.A., Knopf, J.D., 2015. The role of the chief legal officer in corporate governance. *Journal of Corporate Finance* 34, 1-22.

Blair, S.L., Lichter, D.T., 1991. Measuring the division of household labor: Gender segregation of housework among American couples. *Journal of Family Issues* 12, 91-113.

Borokhovich, K.A., Parrino, R., Trapani, T., 1996. Outside directors and CEO selection. *Journal of Financial and Quantitative Analysis* 31, 337-355.

Boserup, E., 2007. Woman's role in economic development. Earthscan.

Boyd, B., 1990. Corporate linkages and organizational environment: A test of the resource dependence model. *Strategic Management Journal* 11, 419-430.

Boyd, B.K., 1994. Board control and CEO compensation. *Strategic Management Journal* 15, 335-344.

Boyd, B.K., 1995. CEO duality and firm performance: A contingency model. *Strategic Management Journal* 16, 301-312.

Brochet, F., Faurel, L., McVay, S., 2011. Manager-specific effects on earnings guidance: An analysis of top executive turnovers. *Journal of Accounting Research* 49, 1123-1162.

Brush, T.H., Bromiley, P., Hendrickx, M., 2000. The free cash flow hypothesis for sales growth and firm performance. *Strategic Management Journal* 21, 455-472.

Budig, M.J., England, P., 2001. The wage penalty for motherhood. *American Sociological Review*, 204-225.

Burgstahler, D., Dichev, I., 1997. Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics* 24, 99-126.

Burns, N., Kedia, S., 2006. The impact of performance-based compensation on misreporting. *Journal of Financial Economics* 79, 35-67.

Cao, J., Pan, X., Qian, M., 2011. Political connection and managerial entrenchment: evidence from CEO turnovers in China. Unpublished Working Paper.

Carpenter, M.A., 2002. The implications of strategy and social context for the relationship between top management team heterogeneity and firm performance. *Strategic Management Journal* 23, 275-284.

Cassell, C.A., Huang, S.X., Sanchez, J.M., 2013. Forecasting without consequence? Evidence on the properties of retiring CEOs' forecasts of future earnings. *The*

Accounting Review 88, 1909-1937.

Chatman, J.A., O'Reilly, C.A., 2004. Asymmetric reactions to work group sex diversity among men and women. *Academy of Management Journal* 47, 193-208.

Chattopadhyay, R., Duflo, E., 2004. Women as policy makers: Evidence from a randomized policy experiment in India. *Econometrica* 72, 1409-1443.

Chen, J., Cumming, D., Hou, W., Lee, E., 2016. CEO accountability for corporate fraud: Evidence from the split share structure reform in China. *Journal of Business Ethics* 138, 787-806.

Chen, Z., Xiong, P., 2001. Discounts on illiquid stocks: Evidence from China. Unpublished Working Paper.

Cheng, Q., Lo, K., 2006. Insider trading and voluntary disclosures. *Journal of Accounting Research* 44, 815-848.

Cheng, Q., Luo, T., Yue, H., 2013. Managerial incentives and management forecast precision. *The Accounting Review* 88, 1575-1602.

Chhaochharia, V., Grinstein, Y., 2009. CEO compensation and board structure. *Journal of Finance* 64, 231-261.

Coles, J.L., Daniel, N.D., Naveen, L., 2014. Co-opted boards. *Review of Financial Studies* 27, 1751-1796.

Coles, J.L., Lemmon, M.L., Meschke, J.F., 2012. Structural models and endogeneity in corporate finance: The link between managerial ownership and corporate performance. *Journal of Financial Economics* 103, 149-168.

Core, J.E., Holthausen, R.W., Larcker, D.F., 1999. Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics* 51, 371-406.

Cumming, D., Leung, T.Y., Rui, O., 2015. Gender diversity and securities fraud. *Academy of Management Journal* 58, 1572-1593.

Datta, S., ISKANDAR-DATTA, M., Raman, K., 2005. Managerial stock ownership and the maturity structure of corporate debt. *Journal of Finance* 60, 2333-2350.

Dechow, P.M., Dichev, I.D., 2002. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77, 35-59.

Dechow, P.M., Sloan, R.G., Sweeney, A.P., 1995. Detecting earnings management. *The Accounting Review*, 193-225.

Dezsö, C.L., Ross, D.G., 2012. Does female representation in top management improve firm performance? A panel data investigation. *Strategic Management Journal* 33, 1072-1089.

Dobbins, G.H., Platz, S.J., 1986. Sex differences in leadership: How real are they? *Academy of Management Review* 11, 118-127.

Donaldson, L., Davis, J.H., 1991. Stewardship theory or agency theory: CEO governance and shareholder returns. *Australian Journal of Management* 16, 49-64.

Duan, T., Hou, W., 2017. Returnee CEOs under weak institutions: Blessing or curse? Unpublished Working Paper.

Eagly, A.H., Karau, S.J., 2002. Role congruity theory of prejudice toward female leaders. *Psychological Review* 109, 573-598.

Earl, M.J., Scott, I.A., 1999. Opinion: What is a Chief Knowledge Officer? *Sloan Management Review* 40, 29.

Eckel, C.C., Grossman, P.J., 2001. Chivalry and solidarity in ultimatum games. *Economic Inquiry* 39, 171-188.

Else-Quest, N.M., Hyde, J.S., Linn, M.C., 2010. Cross-national patterns of gender differences in mathematics: A meta-analysis. *Psychological Bulletin* 136, 103-127.

Faccio, M., Marchica, M.-T., Mura, R., 2016. CEO gender, corporate risk-taking, and the efficiency of capital allocation. *Journal of Corporate Finance* 39, 193-209.

Fama, E.F., French, K.R., 1998. Taxes, financing decisions, and firm value. *Journal of Finance* 53, 819-843.

Fama, E.F., Jensen, M.C., 1983. Separation of ownership and control. *Journal of Law and Economics* 26, 301-325.

Fan, J.P., Wong, T.J., Zhang, T., 2007. Politically connected CEOs, corporate governance, and Post-IPO performance of China's newly partially privatized firms. *Journal of Financial Economics* 84, 330-357.

Farrell, K.A., Hersch, P.L., 2005. Additions to corporate boards: The effect of gender. *Journal of Corporate Finance* 11, 85-106.

Feingold, A., 1988. Cognitive gender differences are disappearing. *American Psychologist* 43, 95.

Ferreira, D., Kirchmaier, T., 2013. Corporate boards in Europe: Size, independence and gender diversity. Cambridge University Press.

Finkelstein, S., 1992. Power in top management teams: Dimensions, measurement, and validation. *Academy of Management Journal* 35, 505-538.

Finkelstein, S., D'aveni, R.A., 1994. CEO duality as a double-edged sword: How boards of directors balance entrenchment avoidance and unity of command. *Academy of Management Journal* 37, 1079-1108.

Firth, M., Lin, C., Wong, S.M., 2008. Leverage and investment under a state-owned bank lending environment: Evidence from China. *Journal of Corporate Finance* 14, 642-653.

Fortin, N.M., 2005. Gender role attitudes and the labour-market outcomes of women across OECD countries. *Oxford Review of Economic Policy* 21, 416-438.

Francis, B., Hasan, I., Park, J.C., Wu, Q., 2015. Gender differences in financial reporting decision making: Evidence from accounting conservatism. *Contemporary Accounting Research* 32, 1285-1318.

Fuwa, M., 2004. Macro-level gender inequality and the division of household labor in 22 countries. *American Sociological Review* 69, 751-767.

Geiger, M.A., North, D.S., 2006. Does hiring a new CFO change things? An investigation of changes in discretionary accruals. *The Accounting Review* 81, 781-809.

Giannetti, M., Liao, G., Yu, X., 2015. The brain gain of corporate boards: Evidence from China. *Journal of Finance* 70, 1629-1682.

Greenhalgh, S., 1985. Sexual stratification: The other side of "growth with equity" in east Asia. *Population and Development Review*, 265-314.

Greig, F., Bohnet, I., 2009. Exploring gendered behavior in the field with experiments: Why public goods are provided by women in a Nairobi slum. *Journal of Economic Behavior & Organization* 70, 1-9.

Guiso, L., Monte, F., Sapienza, P., Zingales, L., 2008. Culture, gender, and math. *Science* 320, 1164-1165.

Guiso, L., Sapienza, P., Zingales, L., 2003. People's opium? Religion and economic attitudes. *Journal of Monetary Economics* 50, 225-282.

Gul, F.A., Srinidhi, B., Ng, A.C., 2011. Does board gender diversity improve the informativeness of stock prices? *Journal of Accounting and Economics* 51, 314-338.

Hakim, C., 2006. Women, careers, and work-life preferences. *British Journal of Guidance & Counselling* 34, 279-294.

Haleblian, J., Finkelstein, S., 1993. Top management team size, CEO dominance, and firm performance: The moderating roles of environmental turbulence and discretion. *Academy of Management Journal* 36, 844-863.

Heflin, F., Kross, W.J., Suk, I., 2016. Asymmetric effects of regulation FD on Management earnings forecasts. *The Accounting Review* 91, 119-152.

Hermalin, B.E., Weisbach, M.S., 1998. Endogenously chosen boards of directors and their monitoring of the CEO. *American Economic Review*, 96-118.

Hillman, A.J., Shropshire, C., Cannella, A.A., 2007. Organizational predictors of women on corporate boards. *Academy of Management Journal* 50, 941-952.

Hoitash, R., Hoitash, U., Johnstone, K.M., 2012. Internal control material weaknesses and CFO compensation. *Contemporary Accounting Research* 29, 768-803.

Holley, D.M., 1998. Information disclosure in sales. *Journal of Business Ethics* 17, 631-641.

Hook, J.L., 2010. Gender inequality in the welfare state: Sex segregation in housework, 1965–2003. *American Journal of Sociology* 115, 1480-1523.

Hopkins, J.J., Maydew, E.L., Venkatachalam, M., 2014. Corporate general counsel and financial reporting quality. *Management Science* 61, 129-145.

Huang, J., Kisgen, D.J., 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? *Journal of Financial Economics* 108, 822-839.

Hyde, J.S., 1981. How large are cognitive gender differences? A meta-analysis using!

w² and d. *American Psychologist* 36, 892.

Hyde, J.S., 1990. Meta-analysis and the psychology of gender differences. *Journal of Women in Culture and Society* 16, 55-73.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.

Jiang, F., Kim, K.A., 2015. Corporate governance in China: A modern perspective. *Journal of Corporate Finance* 32, 190-216.

Jiang, J.X., Petroni, K.R., Wang, I.Y., 2010. CFOs and CEOs: Who have the most influence on earnings management? *Journal of Financial Economics* 96, 513-526.

Kaiser, H.F., 1960. The application of electronic computers to factor analysis. *Educational and Psychological Measurement* 20, 141-151.

Kaplan, S.N., Klebanov, M.M., Sorensen, M., 2012. Which CEO characteristics and abilities matter? *Journal of Finance* 67, 973-1007.

Karamanou, I., Vafeas, N., 2005. The association between corporate boards, audit committees, and management earnings forecasts: An empirical analysis. *Journal of Accounting Research* 43, 453-486.

Kasznik, R., Lev, B., 1995. To warn or not to warn: Management disclosures in the face of an earnings surprise. *The Accounting Review*, 113-134.

Khanna, V., Kim, E., Lu, Y., 2015. CEO connectedness and corporate fraud. *Journal of Finance* 70, 1203-1252.

Kilburn, M.R., Datar, A., 2002. The availability of child care centers in China and its impact on child care and maternal work decisions. Unpublished Working Paper.

Kilduff, M., Angelmar, R., Mehra, A., 2000. Top management-team diversity and firm performance: Examining the role of cognitions. *Organization Science* 11, 21-34.

Kirchmeyer, C., 1998. Determinants of managerial career success: Evidence and explanation of male/female differences. *Journal of Management* 24, 673-692.

Knyazeva, A., Knyazeva, D., Masulis, R.W., 2013. The supply of corporate directors and board independence. *Review of Financial Studies* 26, 1561-1605.

Kross, W.J., Ro, B.T., Suk, I., 2011. Consistency in meeting or beating earnings

expectations and management earnings forecasts. *Journal of Accounting and Economics* 51, 37-57.

Kwak, B., Ro, B.T., Suk, I., 2012. The composition of top management with general counsel and voluntary information disclosure. *Journal of Accounting and Economics* 54, 19-41.

Lazear, E.P., Rosen, S., 1990. Male-female wage differentials in job ladders. *Journal of Labor Economics* 8, S106-S123.

Lee, D., 2017. Corporate social responsibility and management forecast accuracy. *Journal of Business Ethics* 140, 353-367.

Lee, J., Lee, K.J., Nagarajan, N.J., 2014. Birds of a feather: Value implications of political alignment between top management and directors. *Journal of Financial Economics* 112, 232-250.

Lee, P.M., James, E.H., 2007. She'-e-os: gender effects and investor reactions to the announcements of top executive appointments. *Strategic Management Journal* 28, 227-241.

Lee, S., Matsunaga, S.R., Park, C.W., 2012. Management forecast accuracy and CEO turnover. *The Accounting Review* 87, 2095-2122.

Levi, M., Li, K., Zhang, F., 2014. Director gender and mergers and acquisitions. *Journal of Corporate Finance* 28, 185-200.

Li, H., Meng, L., Wang, Q., Zhou, L.-A., 2008. Political connections, financing and firm performance: Evidence from Chinese private firms. *Journal of Development Economics* 87, 283-299.

Liu, Q., Lu, Z.J., 2007. Corporate governance and earnings management in the Chinese listed companies: A tunneling perspective. *Journal of Corporate Finance* 13, 881-906.

Liu, Y., Wei, Z., Xie, F., 2014. Do women directors improve firm performance in China? *Journal of Corporate Finance* 28, 169-184.

Maccoby, E.E., 1988. Gender as a social category. *Developmental Psychology* 24, 755.

Maccoby, E.E., 1990. Gender and relationships: A developmental account. *American Psychologist* 45, 513.

Maccoby, E.E., Jacklin, C.N., 1978. The psychology of sex differences. Stanford University Press.

Mammen, K., Paxson, C., 2000. Women's work and economic development. *Journal of Economic Perspectives* 14, 141-164.

Marini, M.M., 1989. Sex differences in earnings in the United States. *Annual Review of Sociology* 15, 343-380.

Matsa, D.A., Miller, A.R., 2011. Chipping away at the glass ceiling: Gender spillovers in corporate leadership. *American Economic Review* 101, 635-639.

Matsa, D.A., Miller, A.R., 2013. A female style in corporate leadership? Evidence from quotas. *American Economic Journal: Applied Economics* 5, 136-169.

Matsumoto, D.A., 2002. Management's incentives to avoid negative earnings surprises. *The Accounting Review* 77, 483-514.

McConnell, J.J., Muscarella, C.J., 1985. Corporate capital expenditure decisions and the market value of the firm. *Journal of Financial Economics* 14, 399-422.

McConnell, J.J., Servaes, H., 1990. Additional evidence on equity ownership and corporate value. *Journal of Financial Economics* 27, 595-612.

McNulty, T., Stewart, A., 2015. Developing the governance space: A study of the role and potential of the company secretary in and around the board of directors. *Organization Studies* 36, 513-535.

Mencarini, L., Sironi, M., 2010. Happiness, housework and gender inequality in Europe. *European Sociological Review* 28, 203-219.

Mikkelson, W.H., Partch, M.M., 2003. Do persistent large cash reserves hinder performance? *Journal of Financial and Quantitative Analysis* 38, 275-294.

Murray, M., 2006. The bad, the weak, and the ugly: Avoiding the pitfalls of instrumental variables estimation. Unpublished Working Paper.

Nagar, V., Nanda, D., Wysocki, P., 2003. Discretionary disclosure and stock-based incentives. *Journal of Accounting and Economics* 34, 283-309.

Nath, P., Mahajan, V., 2008. Chief marketing officers: A study of their presence in firms' top management teams. *Journal of Marketing* 72, 65-81.

Nelson, J., 2005. Corporate governance practices, CEO characteristics and firm

performance. *Journal of Corporate Finance* 11, 197-228.

Oakley, J.G., 2000. Gender-based barriers to senior management positions: Understanding the scarcity of female CEOs. *Journal of Business Ethics* 27, 321-334.

Ohlott, P.J., Ruderman, M.N., McCauley, C.D., 1994. Gender differences in managers' developmental job experiences. *Academy of Management Journal* 37, 46-67.

Pegels, C.C., Song, Y.I., Yang, B., 2000. Management heterogeneity, competitive interaction groups, and firm performance. *Strategic Management Journal* 21, 911-923.

Peng, M.W., 2004. Outside directors and firm performance during institutional transitions. *Strategic Management Journal* 25, 453-471.

Pfeffer, J., Salancik, G.R., 2003. The external control of organizations: A resource dependence perspective. Stanford University Press.

Pownall, G., Wasley, C., Waymire, G., 1993. The stock price effects of alternative types of management earnings forecasts. *The Accounting Review*, 896-912.

Price, C.R., 2012. Gender, competition, and managerial decisions. *Management Science* 58, 114-122.

Qian, J.Q., Strahan, P.E., Yang, Z., 2015. The impact of incentives and communication costs on information production and use: Evidence from bank lending. *Journal of Finance* 70, 1457-1493.

Ragins, B.R., Townsend, B., Mattis, M., 1998. Gender gap in the executive suite: CEOs and female executives report on breaking the glass ceiling. *Academy of Management Executive* 12, 28-42.

Richard, O.C., 2000. Racial diversity, business strategy, and firm performance: A resource-based view. *Academy of Management Journal* 43, 164-177.

Richard, O.C., Barnett, T., Dwyer, S., Chadwick, K., 2004. Cultural diversity in management, firm performance, and the moderating role of entrepreneurial orientation dimensions. *Academy of Management Journal* 47, 255-266.

Rogers, J.L., Stocken, P.C., 2005. Credibility of management forecasts. *The Accounting Review* 80, 1233-1260.

Rosenstein, S., Wyatt, J.G., 1990. Outside directors, board independence, and shareholder wealth. *Journal of Financial Economics* 26, 175-191.

Ru, H., 2017. Government credit, a double-edged sword: Evidence from the China Development Bank. *Journal of Finance* 73, 275-316.

Ruppel, C.P., Harrington, S.J., 2000. The relationship of communication, ethical work climate, and trust to commitment and innovation. *Journal of Business Ethics* 25, 313-328.

Sapienza, P., Zingales, L., Maestripieri, D., 2009. Gender differences in financial risk aversion and career choices are affected by testosterone. *Proceedings of the National Academy of Sciences* 106, 15268-15273.

Schein, V.E., 1973. The relationship between sex role stereotypes and requisite management characteristics. *Journal of Applied Psychology* 57, 95.

Shivdasani, A., Yermack, D., 1999. CEO involvement in the selection of new board members: An empirical analysis. *Journal of Finance* 54, 1829-1853.

Sila, V., Gonzalez, A., Hagendorff, J., 2016. Women on board: Does boardroom gender diversity affect firm risk? *Journal of Corporate Finance* 36, 26-53.

Skinner, D.J., 1994. Why firms voluntarily disclose bad news. *Journal of Accounting Research* 32, 38-60.

Slater, D.J., Dixon-Fowler, H.R., 2009. CEO international assignment experience and corporate social performance. *Journal of Business Ethics* 89, 473-489.

Srinidhi, B., Gul, F.A., Tsui, J., 2011. Female directors and earnings quality. *Contemporary Accounting Research* 28, 1610-1644.

Stock, J.H., Yogo, M., 2005. Testing for weak instruments in linear IV regression. NBER Technical Working Paper.

Tate, G., Yang, L., 2015. Female leadership and gender equity: Evidence from plant closure. *Journal of Financial Economics* 117, 77-97.

Trueman, B., 1986. Why do managers voluntarily release earnings forecasts? *Journal of Accounting and Economics* 8, 53-71.

Tsui, M., Rich, L., 2002. The only child and educational opportunity for girls in urban China. *Gender & Society* 16, 74-92.

Weber, A., Zulehner, C., 2010. Female hires and the success of start-up firms. *American Economic Review* 100, 358-361.

Westphal, J.D., 1999. Collaboration in the boardroom: Behavioral and performance consequences of CEO-board social ties. A*cademy of Management Journal* 42, 7-24.

Wiersema, M., Mors, M., 2016. What board directors really think of gender quotas. *Harvard Business Review*, 1-6.

Windmeijer, F., 2005. A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics* 126, 25-51.

Wintoki, M.B., Linck, J.S., Netter, J.M., 2012. Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics* 105, 581-606.

Wooldridge, J.M., 2010. Econometric analysis of cross section and panel data. MIT Press.

Wu, X., Zhang, Z., 2010. Changes in educational inequality in China, 1990–2005: Evidence from the population census data. In: Globalization, changing demographics, and educational challenges in East Asia. Emerald Group Publishing Limited, pp. 123-152.

Xu, W., 2010. Do management earnings forecasts incorporate information in accruals? *Journal of Accounting and Economics* 49, 227-246.

Yang, H.I., 2012. Capital market consequences of managers' voluntary disclosure styles. *Journal of Accounting and Economics* 53, 167-184.

Yermack, D., 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40, 185-211.

You, J., Du, G., 2012. Are political connections a blessing or a curse? Evidence from CEO turnover in China. *Corporate Governance: An International Review* 20, 179-194.

Yu, J., Xie, Y., 2011. The varying display of "gender display": A comparative study of mainland China and Taiwan. *Chinese Sociological Review* 44, 5-30.

Zhang, Q., 2016. An introduction to Chinese history and culture. Springer.

Appendix 1 Factor Analysis of Gender Role Values

I apply principal component factor analysis to the six gender role questions in Table A1. According to Kaiser's (1960) criterion, only factors with eigenvalues greater than 1 are meaningful and worth keeping. I retain the first two factors, which together explain 83.9% of the total variance of the six independent attitude question scores. The factor loadings for Q1, Q2, Q3, Q5 and Q6 on *Factor 1* are positive and higher than 0.80, and the factor loading of Q4 on *Factor 2* is equal to 0.981. The factor loadings are actually the correlation coefficients between each question score and the underlying factor. The uniqueness of Q2 and Q3 is around 0.27, which means that about 27% of the variance in Q2 and Q3 scores is not shared with the variance of other questions in the factor model. Collectively, it appears that *Factor 1* is mainly defined by Q1, Q2, Q3, Q5 and Q6, while *Factor 2* is defined by Q4.

In Table A2, I test whether the gender role factors can explain board gender diversity. In models 1 and 2, where *Factor 1* and *Factor 2* are included as separate factors, each of them is significantly and positively associated with board gender diversity. In model 3, where both factors are included simultaneously, I find that only *Factor 1* has a significant and positive effect, while the coefficient on *Factor 2* is positive but insignificant. Jointly, the results suggest that when the societal gender roles are more equal, women's representation on corporate boards is much higher.

Table A1 Factor Analysis of Gender Role Beliefs

This table presents the principal component factor analysis of the gender equality attitude variables derived from CGSS survey questions regarding gender roles in society. Panel A reports the factor eigenvalue, Panel B reports the factor loadings on the first two factors, and Panel C reports the scoring coefficients to generate the scores of the first two factors.

Panel A: Factor analysis

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	3.992	2.950	0.665	0.665
Factor 2	1.042	0.663	0.174	0.839
Factor 3	0.379	0.036	0.063	0.902
Factor 4	0.343	0.174	0.057	0.960
Factor 5	0.170	0.096	0.028	0.988
Factor 6	0.073	.	0.012	1.000

Panel B: Factor loadings

Variable	Factor 1	Factor 2	Uniqueness
Q1	0.956	-0.029	0.085
Q2	0.854	-0.028	0.270
Q3	0.814	-0.252	0.273
Q4	0.116	0.981	0.024
Q5	0.905	0.113	0.168
Q6	0.923	0.044	0.146

Panel C: Scoring coefficients

Variable	Factor 1	Factor 2
Q1	0.240	-0.027
Q2	0.214	-0.027
Q3	0.204	-0.242
Q4	0.029	0.941
Q5	0.227	0.108
Q6	0.231	0.042

Table A2 Gender Role Factors and Board Gender Diversity

This table presents OLS regressions of provincial-level board gender diversity on the first two factors derived from the principal factor analysis of CGSS survey questions. All time-varying control variables are lagged by one year relative to the dependent variable. Cluster-robust *t*-statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Variables are defined in Table 4.1.

Dependent variable = Board gender diversity			
	[1]	[2]	[3]
Gender role attitude:			
Factor 1	0.008**		0.007*
	[2.23]		[1.74]
Factor 2		0.005**	0.003
		[2.13]	[0.97]
Control variables:			
GDP	0.004**	0.002	0.004**
	[2.58]	[1.13]	[2.24]
GDP growth	0.045	0.043	0.034
	[0.73]	[0.63]	[0.57]
Birth rate	-0.005***	-0.003	-0.004***
	[-4.31]	[-1.64]	[-3.50]
%women	0.420	0.468	0.427
	[1.48]	[1.42]	[1.54]
%educated women	-0.021	0.048	-0.003
	[-0.27]	[0.49]	[-0.05]
%married women	-0.046	-0.044	-0.040
	[-0.77]	[-0.80]	[-0.74]
Population density	-1.526***	-1.144*	-1.438***
	[-3.74]	[-1.97]	[-3.25]
Constant	-0.017	-0.071	-0.032
	[-0.13]	[-0.48]	[-0.26]
Year fixed effect	Yes	Yes	Yes
Adj. R^2	0.473	0.428	0.479
N	308	308	308